

AUTOMOTIVE INDUSTRY

The AUTOMOBILE

Vol. XLVI
Number 4

PUBLISHED WEEKLY AT 239 WEST 39th STREET
NEW YORK, JANUARY 26, 1922

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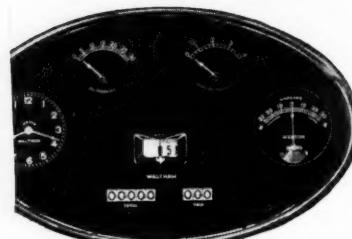
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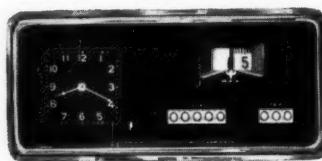
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AUTOMOTIVE INDUSTRIES

The AUTOMOBILE

VOL. XLVI.

NEW YORK—THURSDAY, JANUARY 26, 1922

No. 4

Manufacturers Can Help Solve the Used Car Problem

Dealers must be given a fair chance to get rid of their stock of used cars. Education in sound business methods necessary. "Inside billing" should be discontinued. A thorough market analysis will help.

By Norman G. Shidle

THE used car as a factor in automobile sales has recently assumed large proportions. The problem has always been present in the industry, but business depression brought it to the acute stage. Automobile manufacturers have long since recognized the vital nature of the difficulties confronting them because of the used car and have been particularly active during recent months in discussing ways and means of bettering the situation. Many suggestions have been made, some of which advocate a major operation, others of which lean toward less drastic means.

But the really striking development, in recent opinions on this subject, is the recognition by manufacturers themselves of their own responsibility in helping to solve the problem. While it may properly be said that the used car problem is primarily a dealer problem, it must be added in the same breath that the manufacturer has so large a part to play in co-operating that his actions may mark the difference between success or failure in meeting the situation.

It is perfectly possible for manufacturers to create conditions so unfavorable that the dealer simply cannot operate on an efficient basis as regards used car sales. Certain actions in the past have tended in this direction. In considering his relation to the dealer and the used car problem, the individual manufac-

turer must consider his organization as one of a group, all of which are seeking the same end. An individual company is not likely to be so strong that it will not be affected by the adverse factors which affect others. It is not sound logic for any individual organization to believe that it alone will be able to carry on at the expense of the others. There is nothing in the situation to indicate that such will be the case.

The sales manager of a leading company voiced a sentiment recently which is becoming more common among manufacturers. He said, "Unfortunately there are some manufacturers who have in the past and are now urging their dealers to make long trades. Some are offering large allowances and this, in my opinion, is a very serious menace. How can we expect dealers to become real business men and careful merchants when we advise them to do things that we know are wrong. The dealer must either stop the second-hand car losses or he must get out of business. If this condition doesn't change soon it will be difficult to attract any sane business men to the industry. This would not look well in print but it is true nevertheless, and I can see no other possible solution if some concerted action is not taken on the part of the dealers backed up by the factories."

There are several definite things the manufacturer

can do—or refrain from doing—that will aid materially in improving the used car situation immediately.

The dealer must be given a fair chance to get rid of his stock of used cars. The manufacturers recognize the unsoundness of overloading the dealer with new cars. The manufacturer can be successful only insofar as his dealers are successful. Weathering the present storm must be a co-operative effort in which both dealer and producer must share the burden. Many manufacturers have shouldered their share cheerfully and fairly, and as a result are coming through the trying period with an enthusiastic and loyal dealer organization.

It has been estimated that there are close to 200,000 used cars on the market in the United States to-day. Manufacturers must give their dealers a fair chance to get rid of this burden. Such action may mean less production temporarily, but will build solidly for the future and for permanent profits.

What the N. A. C. C. has chosen to call "inside billings" should be discontinued, since they smack of unfairness in their conception and operate to hinder dealers in general from working out their used car sales on a sound business basis.

But manufacturers have a constructive part to play as well. Since the actual solution of the problem lies with the dealer, the manufacturers' part is to help the dealer and to make conditions for him as favorable as possible. This can be done in several ways, important among which are the following:

1. General educational methods, showing the dealer the folly of overallowance from the standpoint of sound business methods and profits.
2. By urging dealers to properly recondition cars before making a resale and to give a guarantee with his used cars commensurate with what he honestly believes the performance of the car will warrant.
3. By urging the dealer to build confidence in used cars by keeping used car sales, service and advertising methods at the highest level both ethically and materially.
4. By aiding the dealer in market analysis methods; showing him how to properly evaluate the buying capacity of his territory. In some cases the manufacturer's organization may make market analyses and pass them on to the dealer for his use.
5. By aiding the dealer in actually reconditioning cars. This is not practicable in every case, of course, but may properly be considered in many instances.
6. By selling parts for rebuilding cars at a price lower than that charged for regular repair parts.
7. By planning and adjusting factory production on the basis of comprehensive market analyses, so that there will not be a temptation to overload the dealer.

These are the ways in which manufacturers can best help in the solution of this pressing problem. There is some merit, of course, in some of the suggestions contained in the recent survey of the used car situation published by the N. A. C. C., but analysis reveals little that is new or fundamental. As regards these suggestions, certain vital points must be considered.

The tendency of the public to form buying habits, for

example, is important when considering the practical application of these suggestions, especially those advocating a wholesale solution of the difficulty.

This very strong tendency is well illustrated by the present habit of the public in turning in used cars. The owner has been educated by the automobile trade to shop around from one dealer to another seeking the highest allowance on his used car. He has been taught to believe that the sum allowed him for his car has little relation to the actual value of the car, but a great deal of relation to the competitive conditions of the local market.

To overcome this habit is one of the chief difficulties in solving the used car problem. The best way to overcome any habit is to substitute for it another habit. There must be a positive action. But the possibility of substituting another bad habit must not be overlooked. If the present buying habit were successfully replaced by another, and later that other were found to be detrimental to the industry, manufacturers and dealers would have expended much time and money in useless effort.

This possibility emphasizes the necessity for very careful and conservative action as regards concerted attempts to solve the used car problem. Methods and plans must be tested not only on the basis of their immediate effects, but also in the light of their probable future influences. Immediate problems, of course, require immediate solutions, but these current actions must be correlated as closely as possible with sound long range policies if permanent success is to be achieved.

Many plans have recently been suggested. Some of them have merit, but many contain fundamental defects which might render their adoption rather dangerous for one reason or another.

One suggestion which has gained considerable support is that each manufacturer in advertising his new cars shall also advertise the market price of his older models. It is suggested that this advertised used car price would be based on reports from around the country. This evidently assumes some sort of an average price computed from reports gathered from various sections. It is claimed that such a plan would protect the dealer in that the customer could not expect a greater allowance than the advertised price. If the dealer did make a greater allowance, he would be doing it with his eyes open.

The fundamental difficulty with a plan of this kind is that there is no sound basis available for comparison of values. The value of one 1918 Sennett car may be double that of another 1918 Sennett car in 1922. The value of each one depends upon numerous factors such as care, upkeep, mileage, road conditions under which the car has been operated, etc. Even though the average price should be based upon "Rebuilt," "Reconditioned" or "Remanufactured" cars, the case is not materially altered since there is no common definition of these terms.

Consequently, any average price quoted for the country by the manufacturer in connection with his new car advertising would be almost certain to work an injustice to individual dealers if they abided by

it or to cause them difficulties with their customers if they did not. There is nothing more dangerous than a standard when that standard is not based upon accurate definition and sound facts.

It has also been seriously proposed that the problem might be solved by dealers in each locality authorizing one or more independent and impartial appraisers (similar to real estate appraisers) who, for a fee, paid by the dealer or car owner, shall give the sales value of any car submitted by a dealer or customer. This idea is sound in that if properly worked out it would benefit all concerned.

Its weakness lies in the possibility of individual dealers refusing to abide by the decisions of the appraisers. In other words, its weakness is the one which has caused the whole used car difficulty. When it is possible to convince the individual dealer that it is poor business to allow more for a used car than he can get for it, and when all the reputable dealers in a given community are sold on that idea—then the used car problem for that locality will be well on the way to solution.

Thus, if the conditions were brought about under which this appraisal plan could operate successfully, the necessity for the plan itself would be almost eliminated.

Certain of the suggestions that have been made in the N. A. C. C. bulletin would undoubtedly serve to better the situation if adopted, although many of them involve methods that would seem to be obvious from a standpoint of common sense in business operations. It is almost obvious that used car customers should be treated with the same respect as new car purchasers, that service should be given at a fair price, that bookkeeping and financial

practices as regards used cars should be such as to give a credit standing, that local used car dealers should be treated fairly, that high grade men should be placed on used car sales, and that just as good salesmen should be selling used cars as new cars.

This analysis of current suggestions leads directly to the conclusion that the solution of the used car problem rests fundamentally upon the exercise of individual intelligence on the part of those directly handling new and used cars at retail. The root of the problem is struck when the individual dealer is sufficiently strong to refuse to make a sale without making a profit; when he knows how much it costs to operate his business, intelligently evaluates cars offered in trade, knows thoroughly the possible market for those cars as well as the mechanical value of them, and makes an allowance commensurate with the value of the car after these factors are considered.

But there are many things operating to hinder the individual dealer from operating on this basis. Financial stress and immediate needs force the best of men temporarily to unsound practices. And it is here that the manufacturer comes in. Under ideal conditions, the individual dealer would be able to operate as outlined. But conditions are far from ideal, and the manufacturer must do his part to make conditions for the dealer as favorable as possible.

The used car problem cannot be solved by the stroke of a wand; it may be with us always. The used car may remain, however, when the problem has vanished. The manufacturer can help out materially and definitely in the present situation.

Gases in Metals

THE wide field and great practical importance of exact knowledge of the gas content of metals is brought to the attention of the Bureau of Standards more and more frequently. Aside from the more or less familiar importance of gases as related to the deoxidation of steel and the production of sound ingots and castings, many operations in refining, working and treating of metals are vitally concerned with the action or effect of various gases.

Many of the inherent differences in quality of steels made by different processes are generally attributed to the amounts and compositions of the gases with which the metal is in contact when in the molten state in a converter, open-hearth or electric furnace, or in a crucible. It is reported that steel converters operating in a vacuum have recently been successfully used on a commercial scale in England to produce cutlery steel of unusually fine quality. The presence and nature of occluded gas in cast iron has been said to be closely connected with two important characteristics of such material, namely, the graphitization of cast iron and the growth of gray cast iron.

Of no less importance are dissolved or occluded gases in non-ferrous metals. For example, the fire-refining of copper is wholly a matter of intentionally dissolving a gas (oxygen) in crude copper and then removing nearly but not quite all of this same gas. If the final step of this refining is carried to the complete removal of oxygen by poling only a minute or two longer than necessary, the whole furnace charge must be entirely reworked as if it were a fresh charge of crude copper.

In the working and fabrication of copper, gases must be again considered. Operations involving the cleansing of steel or iron by pickling in acids must be followed by

treatments designed to remove hydrogen taken up from the metals by the gases. If not removed, this occluded gas will make the metal too brittle to work or will give trouble in subsequent operations when the metal is exposed to heat, as, for instance, causing blisters in enamel. Occluded gases have also been shown to have a marked effect on the electrical conductivity of metals, their magnetic properties, their consistency in dimensions, as well as their mechanical properties.

British Motorcycle Exports Slump

THE British motorcycle export business suffered a severe slump in 1921. During the first nine months of the year the Union of Cycle and Motorcycle Manufacturers, which comprise over 250 firms, exported only 7000 motorcycles as against three times that number in 1920. The manufacturers, however, exported some 30,000 bicycles, but five times that number were exported in 1920. The accessories and tire export trade also decreased considerably and a total loss of about £6,000,000 was experienced in the export trade up to the end of September. This loss includes that suffered from bicycles and accessories as well as motorcycles.

A prominent manufacturer, speaking of the causes of the slump, said the attitude of trade unions was largely responsible as well as the collapse of the German mark. He said manufacturers were cutting profits to the bone in an endeavor to increase production and reduce manufacturing expenses. Some criticism of the British roadbuilding program was heard, some declaring that they were not satisfied that the road fund was being wisely spent.

Low Fuel Consumption Features New Taxicab Design

New Renault four-cylinder models replace two-cylinder taxicabs of large French company. Overhead valve type engine averages 22.43 m.p.g. Engine designed for high torque at low speeds. Cone clutch, three speed transmission, and spiral bevel rear axle with transverse rear spring used.

By W. F. Bradley

GASOLINE consumption averages 22.43 m. p. gal. under normal city traffic conditions, on the new four-cylinder Renault taxicabs, of which 3200 are about to go into use in Paris. Owing to high fuel costs in France, economy of operation must be very closely studied and the smallest possible engine capable of doing the work made use of. It is for this reason that the great majority of Paris taxicabs have twin cylinder (3.1 x 4.7 in.) engines.

During the last two years the public has been educated to the point of insisting on a four-cylinder taxicab, running more silently and possessing a higher degree of flexibility than the old twins. Citroen was largely responsible for this change, when he put a fleet of his two-seater small four-cylinder (2.67 x 3.93 in.) taxicabs on the streets of Paris. These vehicles are practically the standard touring car chassis with a suitable taxicab body. They are fitted with a Solex carburetor and average 24.7 m. p. gal. The average weight of this taxicab, with two passengers aboard, is 2640 lb.

Renault Parts Assembled by Taxi Co.

Chiefly because of keen competition the Compagnie des Automobiles de Place, which is the largest concern of its kind in France, having a fleet of 3200 taxicabs, has decided to scrap all its two-cylinder models and replace them, within one year, by specially designed four-cylinder models. The most interesting point in connection with these cabs lies in the fact that they have been designed exclusively from a taxicab standpoint by the taxicab company's engineers, with fuel economy as one of the most important considerations. The parts are all being built in the Louis Renault factory, but the taxicab company will do all the assembly work and body building.

Because of competition this company has decided on the use of what is considered to be in Paris a big engine (2.95 x 4.72 in.). With average load the cabs weigh 3300 lb., which is about 660 lb. more than the Citroen. This additional weight is represented by bigger dimensions all around, the Renault having two fixed and two folding seats inside and provision for baggage by the side of the driver. All the tests have been made with Zenith and Solex carburetors, and it is with these that gasoline consumption has been reduced to 22.43 m. p. gal. It should be noted that this figure represents average performance under normal street conditions, with an average driver at the wheel, but, of course, with the carburetor and the mechanism in the best condition.

The engine is an overhead valve type, with detachable

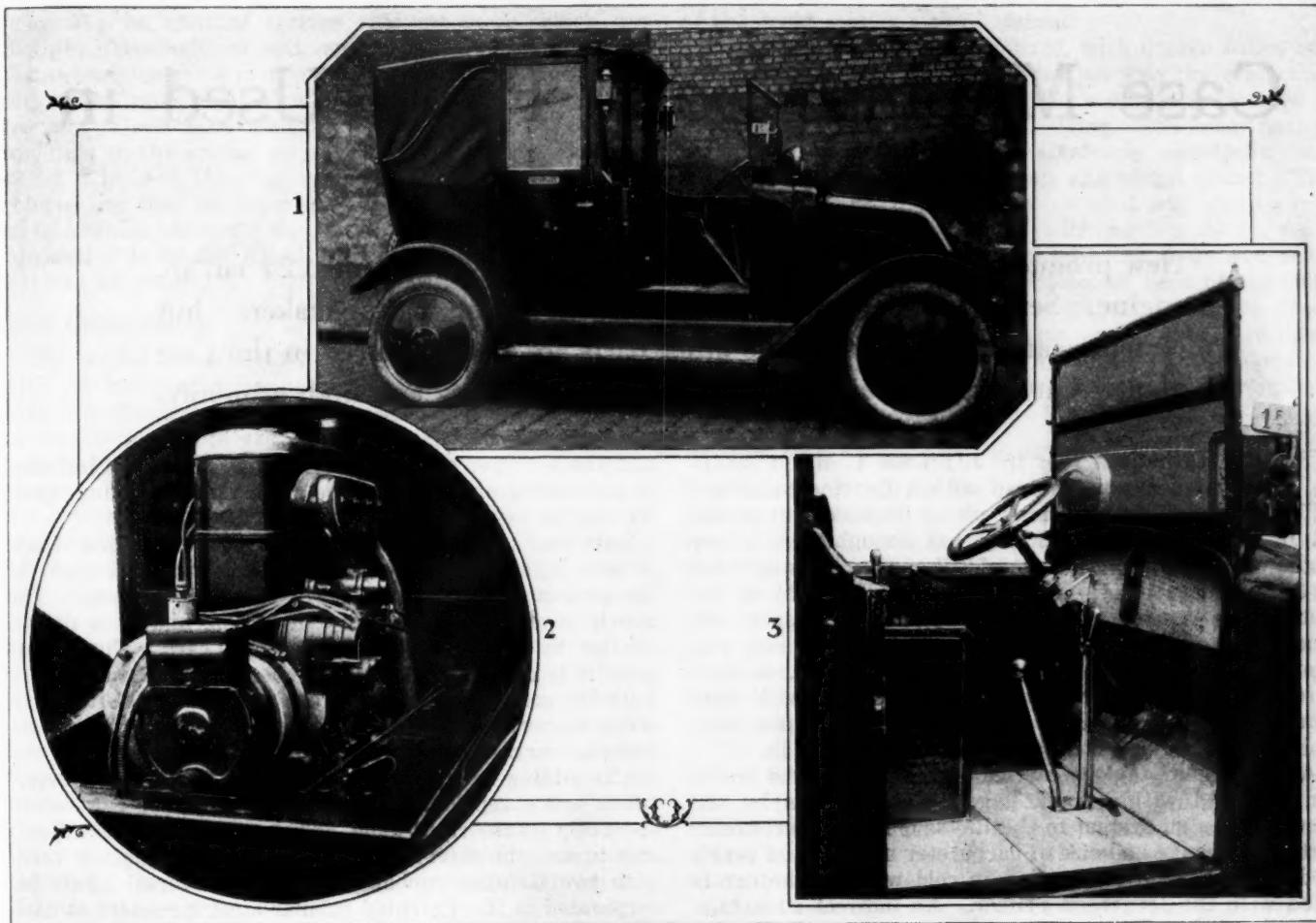
head. The valves, which have a diameter of 1.22 in., are mounted vertically in the head, and are operated by push rods and rockers, the rods being hidden under a detachable aluminum plate and the overhead gear protected by a cast aluminum cover. The crankshaft is carried in two plain bearings. A cross shaft in front drives the high-tension automatic advance S. E. V. magneto, which delivers current to plugs inclined in the right-hand side of the cylinder head. An S. E. V. single unit electric generator and starter is at the front end of the engine. Cooling is by thermo-siphon flow, with the radiator back of the engine, in accordance with Renault practice. A flywheel fan creates a draft through the radiator.

Lubrication is pump circulating type, with the supply of oil first brought up to a copper ramp immediately over the rocker shaft. The lubricant drops directly into oil holes on the shaft bearings and on the rocker arm pivots. A groove on the top of each rocker arm carries the oil to the ball head of the push rod, and the return is made through the hollow push rod to the cam. Surplus oil returns by the pushrod housing to collectors for the main bearings and the connecting rod bearings.

Because of the special work these vehicles have to do, the engine has been laid out for high torque at low speeds. The exhaust opens with a lead of 30 deg. and closes on dead center; the intake opens 4 deg. after upper dead center and closes 20 deg. after lower dead center. The old two-cylinder models had fixed ignition. On the new four-cylinder types the advance is 0 at 500 r.p.m., increasing to 27 deg. maximum at 1500 r.p.m. Compression has been carried to 85 lb. p. sq. in., this being possible with the I-head type of engine and by the use of a 50 per cent mixture of gasoline and benzol. The power curve shows 17 hp. at 1200 r.p.m. and remains practically straight to 1800 r.p.m., dropping off abruptly after this figure.

Operating Methods Employed

The method of operating by the Compagnie des Automobiles de Place is for the drivers to purchase their own fuel, and to retain a certain percentage of their earnings, on a sliding scale, the amount going to the driver increasing with the total earnings. In this way the men are interested in operating with the smallest amount of fuel, and they are the first to object if gas consumption becomes abnormal. Thus when this company found it necessary, in order to meet open competition, to adopt a four-cylinder engine in place of a twin, it had to be certain of getting the same gas consumption with the



1—New Renault four-cylinder taxicab for use in Paris. 2—Power plant of Renault taxicab. 3—Driver's compartment, showing baggage space

larger engine as with the smaller. The company was also interested in adopting a bigger and more flexible engine than those used by rivals, if this could be done without running the gasoline costs too high. The actual gas consumption is higher with the Renaults than with the Citroens, but if weights and seating accommodations are taken into consideration the Renault shows a higher fuel efficiency.

The gasoline-benzol mixture is sold to the drivers at the rate of 5 frs. per 5 litres. Considering the dollar as worth 12 francs, this works out at 31.6 cents per American gallon, compared with the average retail price around Paris of 62 cents per gallon. The explanation is that having guaranteed gasoline prices would not rise to more than three times pre-war prices, the company is obliged to sell to the men at this figure. The cost to the company is about 48 cents per gallon. The gasoline is imported from America and the benzol is obtained from Germany. Owing to the depreciated German mark the latter fuel is cheaper and would be used exclusively if it were possible to get sufficient supplies. This cannot be done, however, owing to the fact that the French Government monopolizes large quantities of the benzol imports in order to market its "national fuel" composed of equal parts of benzol and alcohol.

The new taxicabs have a cone clutch, three-speed transmission and spiral bevel rear axle with transverse rear spring, as on the Renault touring car. This transverse suspension has proved specially satisfactory for variable loads. The change speed lever is in the center, the driver being seated on the left. As the most frequent change is from second to third, the mechanism has been

laid out so that the lever is pushed ahead to go into top speed. This, because the average taxicab driver possesses little skill.

The two sets of brakes are side by side on the rear wheels, the foot brake being on the outside and the hand brake on the inside. As drivers almost invariably use the foot brake, this has been given the outside position, to facilitate adjustment and repair. Dimensions of each brake are 12 by 1.37 in. With rear wheel brakes big surface was necessary to get a quick stop at medium and low-car speeds. This quick stop was obtained in the old cabs by the transmission brake.

Electric lighting will be retained, for it is essential in order to attract clients; but from economy considerations the electric starter probably will be disconnected. Wheel equipment on these taxicabs always has been wood of the fixed type, and although tests have been made with detachable steel disc wheels, it is doubtful if they will be adopted. The argument in favor of wood wheels is that they constitute the weakest part of the car, and in case of an accident they generally break first and thus protect some more vital part. The broken spokes of a wood wheel can be replaced, whereas a steel disk wheel is generally beyond repair after a smash. Tire size always has been 765 by 90 mm., but an increase to 765 by 105 probably will be made.

Features of the body are a landau type with two folding seats. There is a door on the left hand or driver's side, and on the opposite side the panel is double hinged so as to fold back against the body division, leaving the whole of the space to the right of the driver free for baggage.

Case Making Many Parts Used in New Model

New product, known as Model X, has 122 in. wheelbase and 224 cu. in. engine. Several of major units are purchased from parts makers, but clutch, gearset, frame and some other parts are manufactured in the Case plant. Car is said to have unusual accelerating ability and high economy.

DURING the past year the J. I. Case T. M. Co. manufactured a car equipped with a Continental Model 9-N engine which has a piston displacement of 303 cu. in. For 1922 the company has brought out a new model which has the Continental 7-R engine, a six-cylinder of $3\frac{1}{4}$ in. bore by $4\frac{1}{2}$ in. stroke which has 224 cu. in. piston displacement. The Model 7-R is a high speed engine which at 2600 r.p.m. develops 55 hp. The new car, known as the Model X, has a wheelbase of 122 in., as compared with 126 in. for last year's model, and with open touring body weighs 3050 lb. The chassis is also furnished with a Sedan body and then weighs 3350 lb.

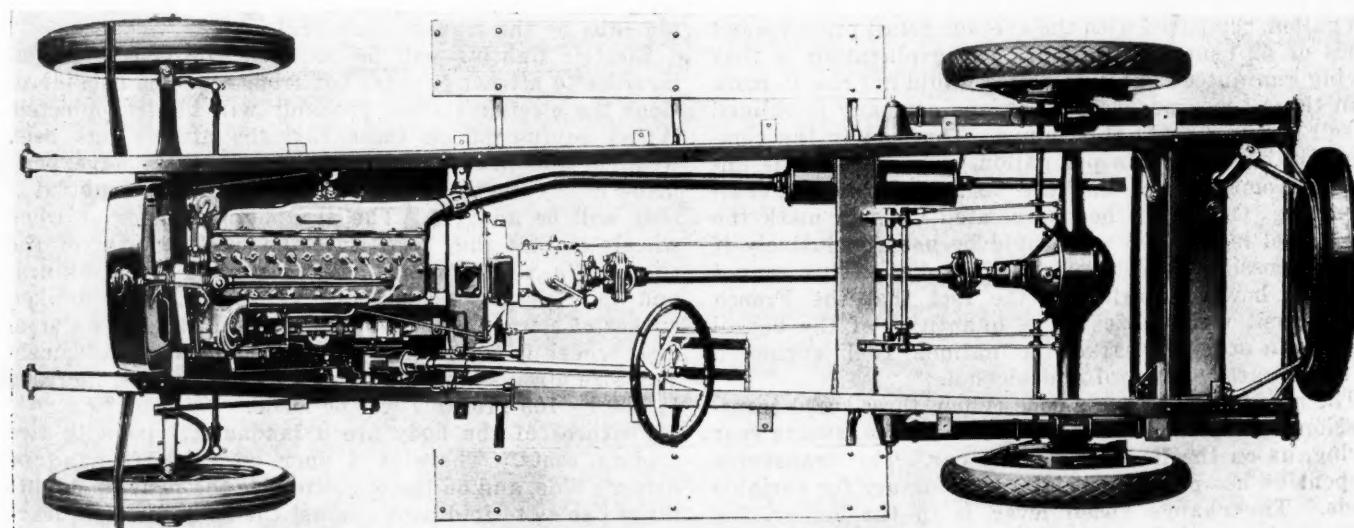
A 15 gal. fuel tank is carried at the rear of the frame and provided with a tank gage. Fuel feed is by the Stewart vacuum system to the Rayfield $1\frac{1}{4}$ in. carburetor—the same make and size of carburetor used on last year's model. As an aid to starting in cold weather the car is fitted with the Jorgensen primer. An indirect advantage claimed for this primer is that it tends to increase the life of the storage battery, this claim being founded on the fact that when the engine is properly primed it will pick up its cycle more readily and the starter will not have to turn it over for so long a time, thus reducing the drain on the battery.

Ignition is by the Delco battery system, while the starting motor and the generator are of Bijur make. The starter drive is by means of the screw shift. A Willard 118 ampere-hour storage battery is provided, as is a Delco combination switch for lighting and starting. All wiring is enclosed in flexible metallic conduit. The radiator, which is made in the Case shops, is of the flanged tube type

and has a copper core. A Rayfield thermostat is included in the cooling circuit to insure more rapid warming up of the engine in cold weather.

Last year's model was equipped with a clutch and transmission manufactured by parts makers, but these parts in the present model are made in the Case factory. The clutch is of the multiple dry disk type and of a design similar to that used on earlier Case cars. The transmission is mounted on Timken roller bearings throughout. Both the gears and the shafts are made of nickel steel. In order to permit of making the case oil-tight the shifter forks are arranged to slide on their shafts, instead of the shafts sliding in guides in the case. The control levers, which are exceptionally long, are located for convenient operation by the right hand. The pedals are made adjustable to suit the driver. A tubular propeller shaft is used, with two Griptite rubber and fabric universal joints incorporated in it. Patented tubular steel spreaders at each bolt hole of these joints are claimed to allow of greater original clamping pressure on the bolts and to reduce the need for further tightening.

Both axles are of Columbia make. The rear axle has a helical bevel gear drive with a reduction ratio of $4\frac{1}{3}$ to 1. The helical gears and pinion shaft are of nickel steel. The Hotchkiss drive is employed, obviating the need for a torque arm or torque tube. Bock roller bearings are used on both the rear and the front axle. The steering gear is a Jacox with 18 in. corrugated composition handwheel rim and aluminum spider. The brake drums for both the service and emergency brakes measure 16 by $2\frac{1}{2}$ in. Oil-less bushings are fitted in the brake shafts.



The chassis of the new Case model

The frame is put together in the Case factory. It has 6 by $2\frac{1}{4}$ in. channel section side members which are straight from end to end, and are connected by three channel section cross members and one tubular cross member at the rear end. Semi-elliptic springs are used all around. These have alloy steel main leaves and bronze bushings in the spring eyes. The front springs measure 39 by 2 in. and the rear springs 54 $\frac{1}{2}$ by $2\frac{1}{4}$ in. It is pointed out that the rear springs are placed close to the wheels, which increases the stability of the body. Chassis lubrication is by the Alemite grease system, with connections at 28 points.

Body Construction

The bodies are built of kiln-dried ash and maple wood, with all joints screwed and glued. Frames are covered with No. 20 gage body steel with door moldings formed in the steel. Doors are $22\frac{1}{2}$ in. wide and are hung on outside hinges. All doors are provided with strap door checks. The body is mounted on ten supports riveted to the frame side members, and anti-squeak fabric is used at all points between the body and supports. Anti-squeak fabric is also provided at all points of contact of aprons, body and frame. Backs and cushions are upholstered in dull finish black leather. The cushions have 8-in. double deck springs and the interiors of both the front and the rear compartments are lined throughout. In the driver's compartment the floorboards are covered by linoleum bound with aluminum. Fenders and aprons are black enameled, while the bodies are given sixteen coats in the finishing process. In the open car the rear seat is 47 in. wide, providing plenty of room for three grown persons. The instrument board, which is of inlaid walnut, carries the combined lighting and ignition switch, speedometer, ammeter, oil pressure gage, choker, Jorgensen primer,

dashlight and ventilator adjuster. The panel in the rear of the front seat is also of walnut.

Drum type headlights are fitted, with double bulbs, one for dimming. There is a tonneau lamp on the rear cowl. A windshield of the Case company's own manufacture is fitted, and is set at an angle of 10 deg. The lower part is stationary and claimed to be absolutely rain-tight. All wing nuts and screws are copper and nickel plated. The top is a five-bow, one-man type covered with double texture material. It is provided with an 8 x 20 in. plate glass rear light. Curtains open with the doors and when not in use are folded in a compartment back of the solid front seat. The side aprons, which close in the space between the body, running boards and fenders, are made of No. 22 gage steel. A front apron of No. 20 gage steel fits over the frame horns and protects the radiator against dirt.

Accelerating Ability and Fuel Economy

Emphasis is laid by the makers on the acceleration of the car. It is said to be possible to pass from 5 to 20 m.p.h. in 6.5 seconds; from 5 to 30 m.p.h. in 11 seconds and from 10 to 30 m.p.h. in 9 seconds. Notwithstanding this very creditable acceleration the car is said to make 22 miles per gallon of fuel. The speed range is given as 1 to 70 m.p.h. on the high gear. The lower limit of 1 m.p.h. probably assumes slipping of the clutch, for it is hard to conceive of the engine running at 50 r.p.m., as it would have to without slippage to give this car speed.

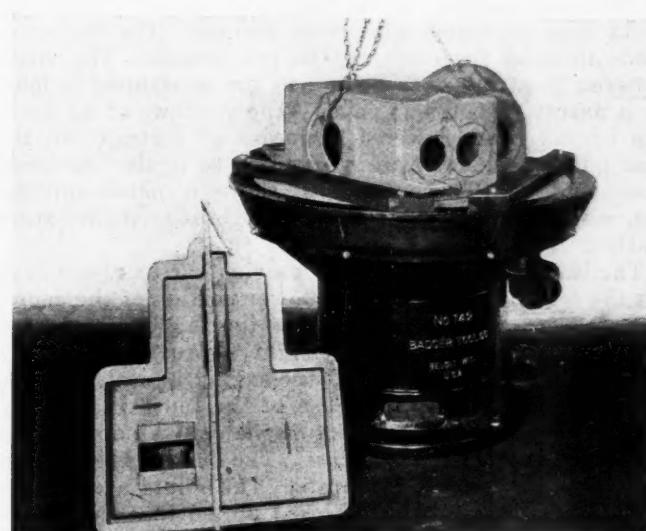
The equipment includes a Stewart 75 m.p.h. speedometer driven from the transmission by enclosed gearing; a Boyce Motometer, a Kellogg power tire pump driven from the transmission by enclosed gearing and a Klaxon motor-driven horn. The tires are 34 x $4\frac{1}{2}$ in. Goodyear cord with heavy tourist tubes.

Facing Transmission Cases on Disk Grinder

A NEW vertical spindle type of disk grinder is now being built by the Badger Tool Co. The steel disk wheel is 42 in. in diameter and is faced with an abrasive compound which is molded directly onto the steel disk wheel $\frac{1}{2}$ in. thick. The accompanying illustration shows the machine surface grinding the face of a large tractor transmission case and cover. It will be noted that this machine is direct motor-driven, the shaft of the motor serving as the grinding disk spindle. Positive or force feed lubrication is supplied to both the radial and thrust ball bearings. The motor used is a 20 hp. and runs at 600 r.p.m. A circular dust channel completely surrounding the periphery of the wheel terminates in two openings to which the dust exhaust system is attached. This dust channel is exposed by removing the outside guard ring, which forms the outer wall of the dust channel.

The casting shown in place on the disk wheel measures approximately 32 in. in length by 28 in. in width and weighs 300 lb. The flange to be surfaced clean and flat is 2 in. wide, giving a total area to be surfaced of 250 sq. in. Stop bars are attached to the guard ring to prevent the work from revolving with the disk wheel. The actual grinding time on this piece was 8 min. We are informed that by altering the pattern of the casting to conform to correct disk grinding principles this grinding time could be substantially reduced. A quarter-ton chain hoist mounted on a trolley and an I-beam located over the center of the disk wheel is a great convenience in handling heavy work on the grinder.

It will be observed that this machine is accessible from all sides, so that on smaller parts more than one operator can work on the machine at the same time. The No. 142 Badger grinder complete with one disk wheel weighs 3800 lb.



Surface grinding the face of a large tractor transmission case and cover

Utility Closed Cars Feature New Dort Line

Roadster and touring car bodies are used as basis for new coupe and sedan which are but little more expensive than open models. Dry multiple disk clutch replaces cone type. Weight of pistons and connecting rod reduced.

TWO new utility closed models are the chief features of interest in the Dort line for 1922. The new coupe is priced at \$1,165, which is just \$180 higher than the touring car price. The new sedan will sell for \$1,195, or \$210 more than the open job. The former coupe and sedan, priced at \$1,495 and \$1,645 respectively, are being continued without material change. The chief mechanical change consists of the substitution of a dry multiple disk clutch for the cone type formerly used, although there have been numerous minor refinements in both engine and chassis construction.

The new closed jobs, with their low price difference, in comparison with the open models, appear to be a definite attempt to give an all-year-round car to the man who needs it for utility purposes. The general trend in this direction which appeared at the New York show makes the details of these models of particular interest at this time.

To get these new designs down in cost the touring body is used as a basis. Over this a solid windshield, similar to that used on the regular sedan, has been built in and the standard windshield body post is used. The pillars which support the roof are permanently built in as a part of the framing of the lower portion of the body, and are not spliced on, as in some separable winter top designs. The doors are made integral from the top to the bottom. The space between the front door pillar and the windshield is filled by a narrow, triangular panel. The windows of all doors can be raised and lowered by means of a strap, but the rear quarter windows are stationary, as is also the large rear window. The exterior of the rear panel and the top, which is of the soft type, is covered with imitation leather.

* The leather trimming of the touring car has been kept for the seats and inside of the lower portion of the doors, but the roof and sides above the touring body line are trimmed with cloth. A dome light is provided. It may be said in a general way that the saving in cost on these closed bodies is due to the use of the touring car body as a basis. The elimination of mechanical window lifters is also a factor in reduced cost. The entire construction is strong, though not elaborate. The joints around the doors have been carefully closed up, so that the car is warm and comfortable. A windshield sunshade is fitted and a package compartment is provided back of the seat in the coupe.

There have been other interesting changes incorporated in the Dort line, although they are, in general, of minor importance. As noted previously, a dry multiple disk clutch takes the place of the former cone type. It consists of six friction disks, $7\frac{1}{8}$ in. in diameter. The clutch is released through an improved radial thrust bearing. It is lubricated from an oiler on the floor board. Another refinement in the transmission system is in the widening of the gears in the gearset. The gears in the new assembly overlap each other in such a way as to increase the effective driving surface of the teeth. It is claimed that the combined effect of these changes results in about $1/16$ in. increase in tooth width.

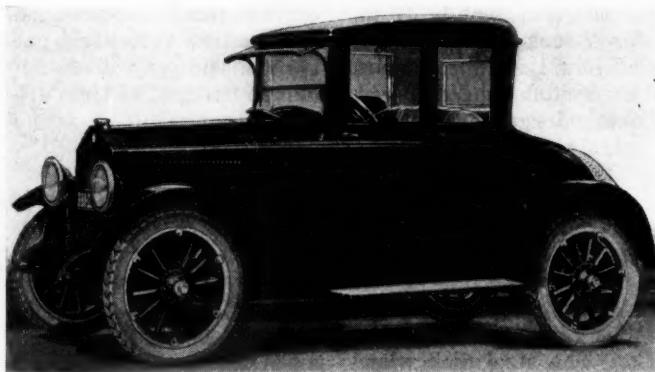
Refinements have been made in the carburetor to handle the present quality of fuel. Dort, some time ago, reduced the size of the high- and low-speed carburetor jets to effect a saving in the consumption of gasoline. Difficulty has occasionally been experienced with the clogging of the high- and low-speed jets in their reduced diameter. This possibility has now been eliminated by replacing the present wells with new ones which are provided with circular screen strainers.

Lighter pistons and connecting rods have replaced those used previously, the weight of the new piston and connecting rod being $4\frac{3}{4}$ lb. against 5 lb. 14 oz. for the former assembly. The decrease in weight in the reciprocating parts has resulted in a smoother engine.

A new type of ignition switch has been installed, this switch being made by the Clum Mfg. Co. and furnished with a combination key. The ignition coil now used is the new type Connecticut.

The final drive has been changed to the spiral bevel gear type. The ring gear has 49 teeth and the pinion 11, giving a reduction of $4\frac{5}{11}$ to 1. To make the most satisfactory use of the spiral bevel gear differential and take care of the thrust there has been incorporated with this change a hardened and ground sleeve in place of the soft liner previously fitted.

Split spring seats are provided with shims which can be removed if play develops at the spring seats, and thus a tight connection is assured with a minimum of cost and labor. Thrust collars have been incorporated in the design, along with the split spring seat, to remove the possibility of side slapping. An adjusting screw has been provided in the rear of the service brake band so that excessive clearance at that point is eliminated.



New Dort coupe, a closed job in which the roadster body is used as a basis

Small Caterpillar Tractor Built for Farm Work

Engine has overhead camshaft. Novel track mounting scheme obviates danger from clogging track. Alloy steel used largely in construction. A feature claimed for this model is its ease of handling in restricted space. Is adaptable for industrial as well as for agricultural purposes.

By P. M. Heldt

A SMALL tractor designed on the caterpillar principle has been developed by the Holt Mfg. Co. and was recently announced by the Stockton plant of the firm as the Model T-35. The purpose in developing this model was to build a small tractor that would be easy to operate, incorporate only features proved out under field conditions, be economical in fuel and oil consumption and cheap to maintain.

Having a three-speed transmission, the T-35 has a range of adaptability that includes all sorts of farm, orchard, vineyard and industrial work. To make it suitable for row crop cultivation the width was kept down to 48 in., and to suit it to vineyard work the height was limited to 52 in. The machine is claimed to possess exceptional handling ability in restricted spaces. Weighing only 4000 lb., it can be readily loaded onto a small motor truck and transported from one place to another. With a track width of 10 in. the pressure on the track is only 4 lb. per square inch, and the tractor is, therefore, able to work on the softest ground. The ground clearance is 11 in.

In the design of the T-35 the unit or backbone form of construction has been followed, whereby the frame is eliminated. The engine base with flywheel bell housing is bolted to a flange on the transmission with sixteen $\frac{1}{2}$ -in. bolts. At the rear the tractor is suspended by means of a cross pivot tube on which the trucks are pivoted through the intermediary of a drive link. The latter is hinged to the truck in front of the tube, its rear portion resting on a heavy rubber pad directly under the pivot tube. This method of mounting the trucks removes the weight from the track sprocket and transmission, and these parts are subjected to strains of propulsion only.

Advantages of Track Mounting

Two distinct advantages are claimed for this method of mounting the tracks on the pivot shaft and pushing them with the drive link. The first is that it gives easy riding qualities, and, the second, that it permits of a track release which is said to be an exclusive feature with the Holt. This release is designed to operate if the track becomes clogged with dirt or rocks and permits the truck to "jack-knife." When that happens the track can slip over the rear sprocket, thus obviating the danger of damaging parts of the machine.

The front end of the tractor is supported by a cross-leaf spring, which pivots at its center on a pin secured in the engine crankcase directly under the center bearings. The outer end of this spring rests on a bracket on the truck frame, which is so shaped that the weight

exerted by this spring on the truck frame comes in the middle of the frame and not on one side. The pivoting, as well as the action of the spring itself, serves as an equalizer on rough or irregular ground and gives the whole tractor a full three-point suspension.

Engine Details

The engine of the T-35 "Caterpillar" tractor is the result of the joint efforts of Pliny E. Holt, vice-president in charge of engineering of the Holt Mfg. Co., and Col. E. G. Hall, one of the designers of the Liberty aircraft engine. The bore is 4 in. and the stroke $5\frac{1}{2}$ in. The crankshaft is a chrome vanadium steel forging, $2\frac{1}{4}$ in. in diameter. It is heat-treated to from 50 to 60 points scleroscope hardness. The bearings are of bronze-backed babbitt. The rear bearing is $3\frac{1}{4}$ in. long, the center bearing 3 in. and the front bearing $2\frac{5}{8}$ in. At a speed of 1000 r.p.m. this engine develops 28 hp. on the block.

By the use of an overhead camshaft the crankcase is kept free from obstructions; tappets, tappet guides and inclosures for same are eliminated, and all moving parts in the head are provided with an oil bath. By removing the cylinder head cover, not only are the valves and valve springs exposed, but the camshaft and its bearings are rendered accessible. The camshaft carries only four cams, which operate the valves through forged nickel steel rocker arms. The valves are set in the heads at an angle.

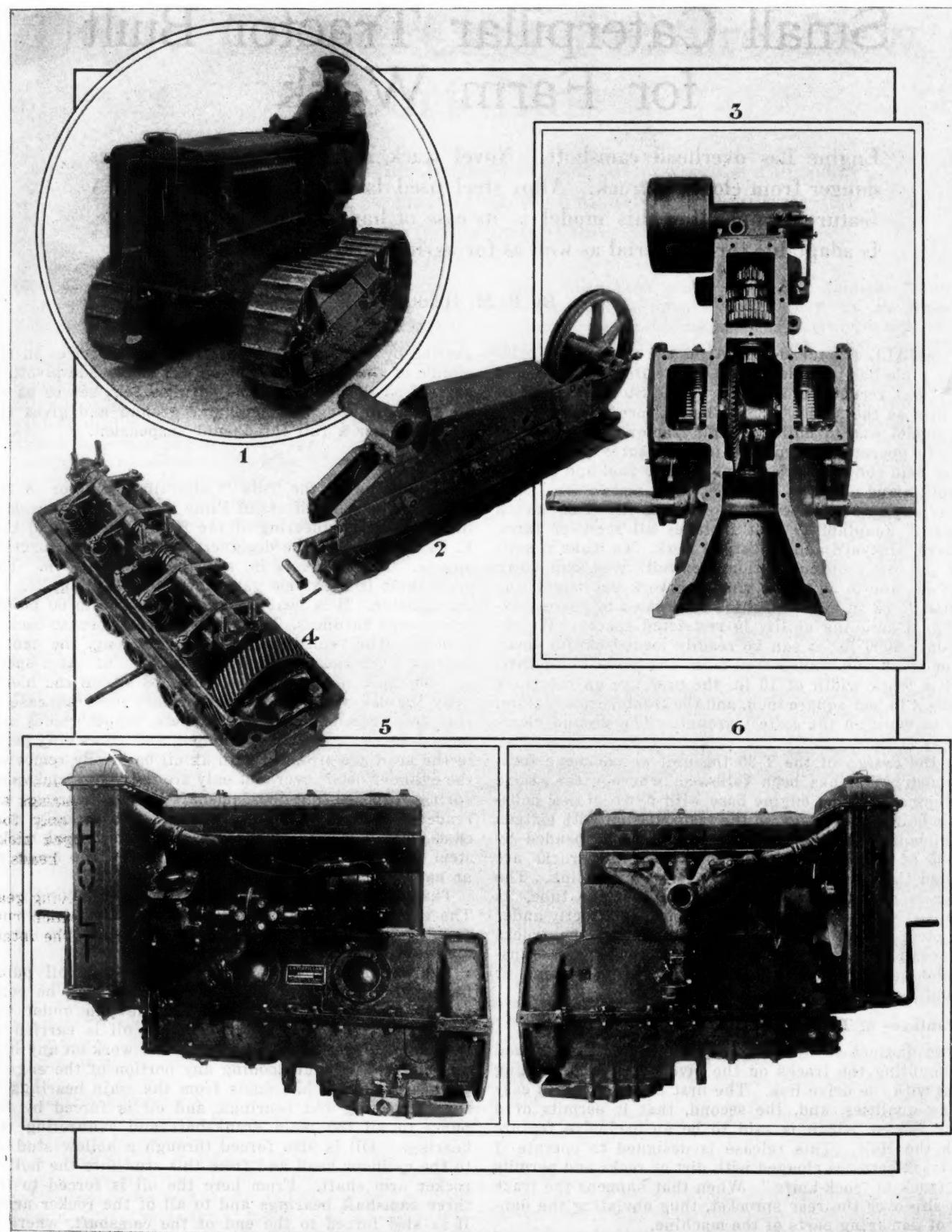
The governor is mounted in the camshaft driving gear. The throttle valve is controlled by a shaft which runs from the inside of the head cap directly into the intake manifold.

Lubrication is by pressure. A two-stage oil pump is bolted to the front of the engine and can be completely removed in five minutes. The pan under the connecting rods remains dry and all oil is carried in the sump. This permits the tractor to work on any hill, up or down, without flooding any portion of the engine.

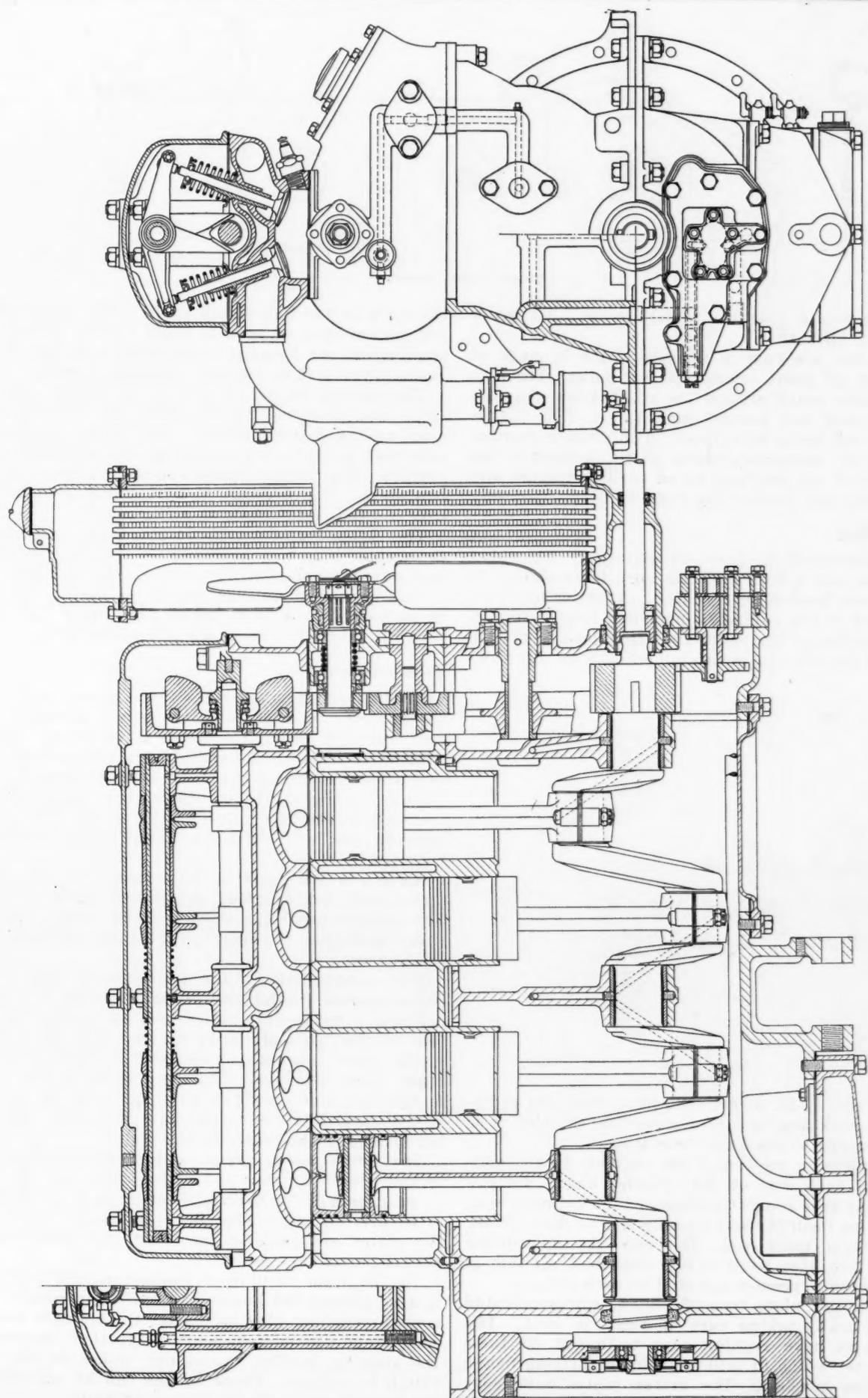
The crankshaft has ducts from the main bearings to the connecting rod bearings, and oil is forced by the pump to all the main crankshaft and connecting rod bearings. Oil is also forced through a hollow stud up to the cylinder head and from this stud into the hollow rocker arm shaft. From here the oil is forced to the three camshaft bearings and to all of the rocker arms. It is also forced to the end of the camshaft, where it lubricates the governor from the inside and gives a dash-pot effect that insures smooth governor action.

On the front end of the crankshaft is a wide-faced chrome nickel steel pinion which drives through an intermediate gear to the fan. The fan gear drives the main

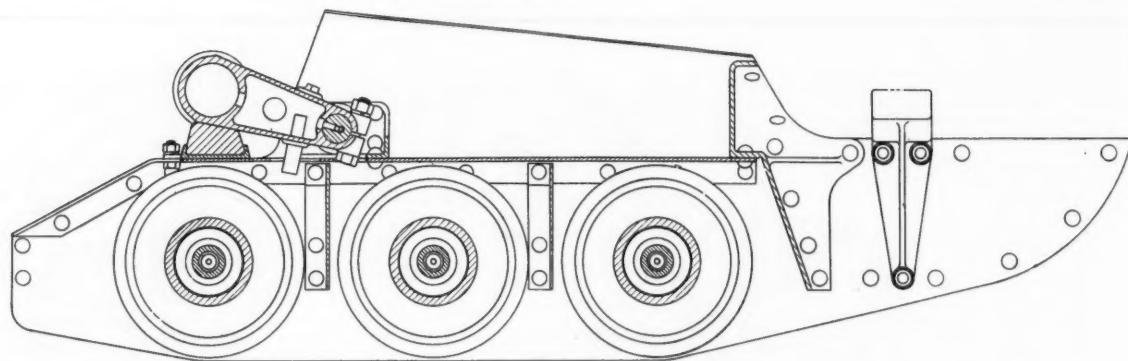
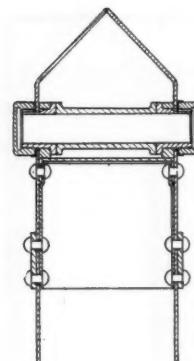
January 26, 1922



1—Holt Caterpillar light tractor Model T-35. 2—Track assembly, showing rear suspension of tractor and track release link feature, 舍型 frame and front idler. 3—Transmission unit, including change speed gears, side clutches and stationary attachment. 4—Valves, camshaft, governor and timing gear in removable head. 5 and 6—Left and right sides of engine and radiator assembly



Longitudinal section and front elevation of Holt 35-hp. tractor engine



Track frame assembly

camshaft gear and also the water pump. All gears operate in an oil bath.

The cylinders are cast in a block which is made of gray iron of 40 point scleroscope hardness. There is a liberal water space around the combustion chamber of each cylinder and around each valve. The fan is gear-driven and has a slip clutch on the inside running in oil. Quickly removable plates on the bottom of the crankcase allow all bearings to be easily adjusted and permit pistons and connecting rods to drop right out.

Engine Cooling

The radiator is of the finned tubular type. The tubes are made up into a core and this core bolts solidly to top and bottom headers of cast iron. A projection from the front end of the engine is machined into a spindle. The lower header of the radiator is machined to fit this spindle, and the radiator is slipped onto the spindle from

the teeth on the hub clutch shaft. The spring pressure per square inch of area is made low, to insure a soft engagement and long life of the friction lining. A clutch brake is provided to facilitate shifting of gears.

The driving plates of the clutch are of cold rolled steel, and asbestos friction disks are riveted to both sides of the driving plates. The driven plates are of saw steel, properly tempered to give a very hard wearing surface. The driving flange and driving hub are of carbon steel. The pressure release plate is of malleable iron and the clutch shaft of nickel steel.

The clutch forms a self-contained unit and is readily accessible; it is only necessary to remove the transmission cover, whereupon the clutch may be taken out as a unit without disturbing any other parts. The clutch throw-out bearing is a radial and thrust ball bearing which is lubricated by an Alemite grease plug.

Transmission

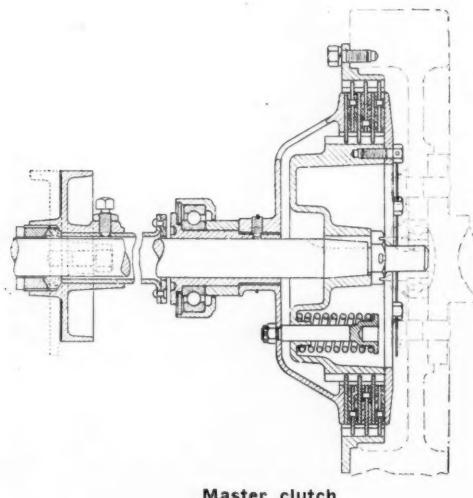
The transmission provides three speeds forward and one reverse. In every case the power is applied to the rear sprocket through three gear contacts. Power is transmitted from the engine through the main driveshaft to a selective sliding gear and thence through a longitudinal countershaft on which the bevel pinion is mounted, to the bevel gear on the clutch shafts, on the opposite end of which the final drive pinions are mounted.

All shafts and gears in the transmission are made of nickel steel, heat-treated. All sliding gears are splined. The main transmission shaft is fitted with a heavy-duty roller bearing at the rear and a double row ball bearing at the front.

The countershaft in the transmission has a double row combined radial and thrust bearing on the rear end and a heavy-duty roller bearing on the front end that carries the main drive pinion. The bevel gear (a nickel steel forging) is mounted between adjustable taper roller bearings. The main bevel gear is splined to take the side clutch driving hub and the inner end of the clutch shaft is carried in a high-duty roller bearing located in the center of this hub.

The side clutches are of similar construction to the master clutch, in that the plates drive and are driven by gear teeth cut on their outer or inner diameter, instead of by driving lugs. The side clutches run in oil, all of the plates are made of hardened saw steel and none have asbestos facings.

To facilitate turning a Raybestos-lined brake band is used around the housing of each side clutch. These brakes come into play only after the clutches have been completely disengaged, when a further movement of the steering handles causes the brakes on the desired clutch to engage. These brakes can be adjusted from the driver's seat without the use of tools.

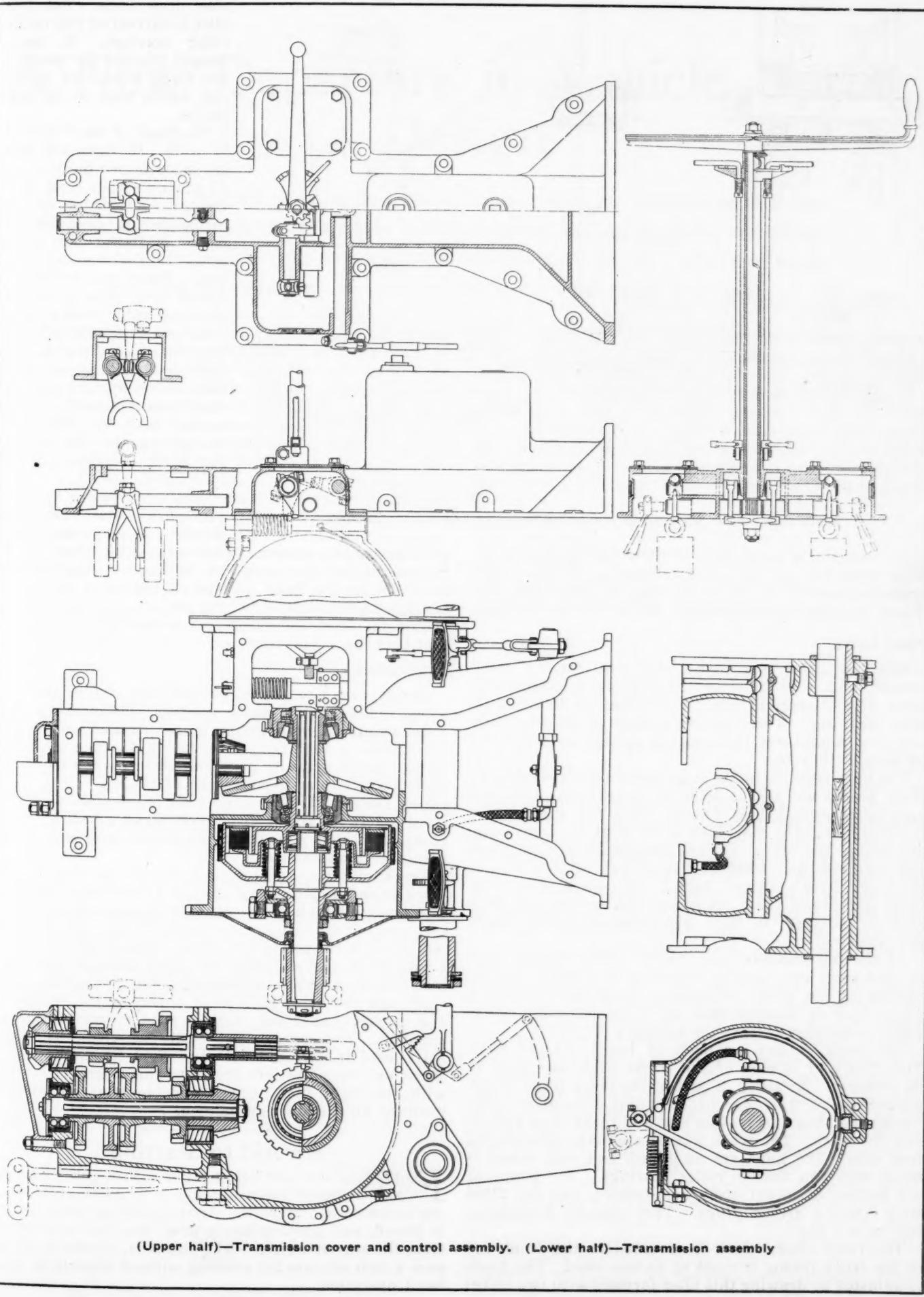


Master clutch

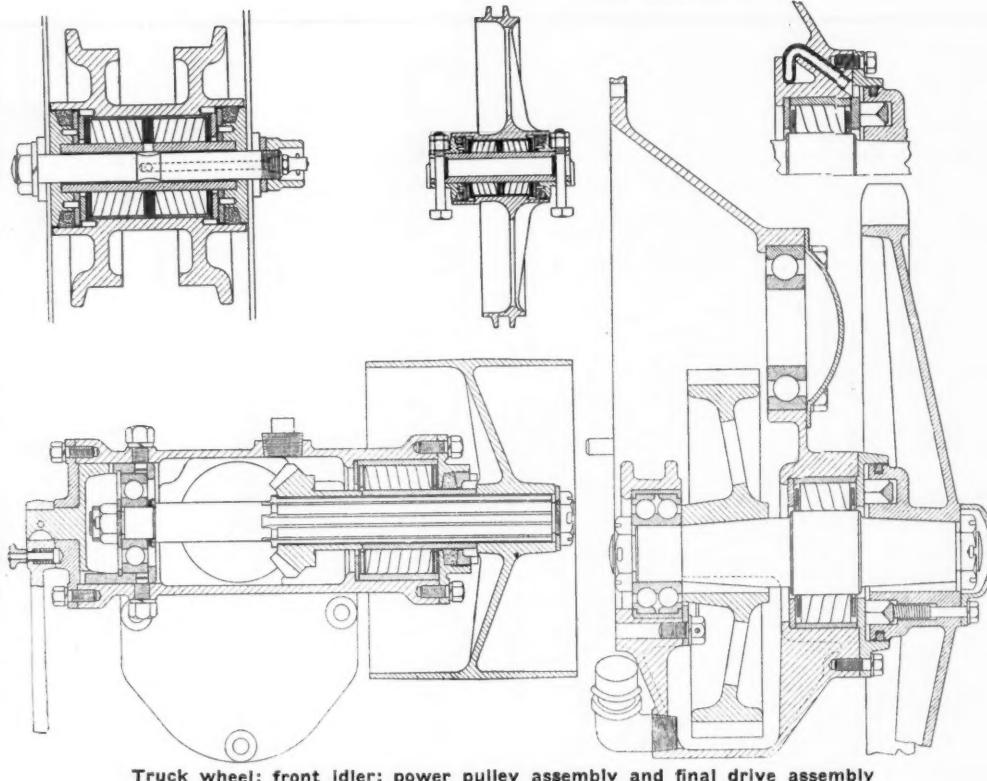
the front. Two $\frac{3}{4}$ -in. nickel steel studs hold the radiator to the crankcase, and to remove the radiator it is simply necessary to unscrew these studs.

Water returns to the top of the radiator by two outlets—one on each side of the cylinder head. Instead of the regular hose connection between the cylinder head and the engine itself there is a connection to the cylinder head by a single center stud. To remove the top radiator connections the hose itself is not disturbed, all that is necessary being to remove one stud on each side.

A multiple dry plate type of clutch, spring-actuated and automatically taking care of wear, is used. The driving plates have regular gear teeth cut on their outer diameter which fit into teeth in the driving flange bolted to the flywheel. The driven plates have gear teeth cut on their inner circumference which fit into



(Upper half)—Transmission cover and control assembly. (Lower half)—Transmission assembly



Truck wheel; front idler; power pulley assembly and final drive assembly

By means of a pedal both of these brakes can be applied when the tractor is either running or idle. This brake is provided for use in descending steep hills, and it can be locked in position if the tractor is standing.

Final Drive

The final drive gear is a nickel steel forging, heat-treated, and is mounted on the final drive axle with a taper fit and straight key. It is mounted in the final drive gearcase. The shaft is supported on the inner end by a double row ball bearing and on the outer end by a roller bearing.

The only opening in the final drive case is where the shaft passes out to the final drive sprocket, and that opening is protected as follows: Two felt washers are inserted in a cavity machined in the final drive gearcase, one within the other; springs are placed against these felt washers, and when the small cap on the end of the track drive sprocket shaft is secured in place with three cap screws, these cap screws put pressure on three springs and they, in turn, put pressure on the heavy felt washers.

As the felt washers wear, these springs follow them up and keep any opening closed at all times. On the outside of the cavity containing these felt washers a piston ring is inserted into an inclosure, which gives added protection against the entrance of dirt.

The truck frames are made of heavy pressed steel. The shed roof is part of the frame itself and adds to its strength. An apron, a part of the truck frame itself, projects below the gudgeons, extending down close to the track shoes, thus preventing dirt and rocks from getting into the track. The truck wheels are made with chilled iron rims. The hubs are machined, and each wheel is fitted with two flexible roller bearings. The gudgeons are hollow, of nickel steel, heat-treated, and are fitted with Alemite grease plugs. They require lubrication only once a day.

The front idler, which is mounted in the front end of the truck frame, is made of carbon steel. The track is adjusted by drawing this idler forward with two nickel

steel draw bolts. The front idler is carried on two flexible roller bearings. It has a flanged rim and the weight of the track is carried on this rim, rather than on the space blocks.

The track of the T-35 is 10 in. wide. Its links and shoes are made in one piece of medium carbon steel, heat-treated. A bushing of high carbon spring steel, oil tempered, is forced into a machined hole in one end of the link. When this bushing is forced into place it springs outward, which insures that it will remain tight at all times. On the outside of this bushing there is an oil tempered spring steel roller which moves slightly as each tooth comes in contact with it. This tends to prolong the life of both the track sprocket and the bushing.

The track pin is made of chrome nickel steel, heat-treated. It is turned from a solid square bar, a square head being left. When the pin is inserted into the track link, this square head is tight in a slot in the link. Instead of putting a cotter pin through the opposite end of the pin, a cotter pin is placed behind the head and through a drilled hole in the lugs that hold the square head.

Lubrication

Grease cups are almost entirely eliminated, only two being found on the whole tractor. These are on the water pump. Alemite grease plugs are used where daily lubrication is required. The engine has one oil filling point. An oil pressure gage located in plain view of the operator tells him the pressure of the oil in the lubricating system. Lubrication of all truck wheels and the front idlers is accomplished by eight Alemite grease plugs, to which a generous supply of grease is to be furnished once each day.

Track oiling and the oiling of the pivot shaft and truck drive link is accomplished in a very simple manner. The track oil tank is on top of the transmission cover, and two valves within easy reach of the operator distribute oil to the points mentioned. The oil flows through a tube to the hollow pivot shaft and through this shaft into the drive links, automatically lubricating the pivot shaft and the drive links as it passes to the tracks.

A bucket-shaped seat with a good spring cushion is supplied. The controls are easily handled. The gear shift lever is operated with the right hand, the clutch throw-out with the left foot and the emergency brake with the right foot. Spark and throttle controls are mounted on the steering column.

An Aid to Starting

FIAT cars are now being fitted with a patented sole-noid-operated valve which acts as a strangler, closing automatically when the electric starting motor switch is closed, and opening again when the foot is removed from the starter switch. The object is, of course, to insure a rich mixture for starting without depending upon hand operation.

A New Departure in Vehicle Spring Design

Unusual type of construction employed requires no shackles or lubrication, and is said to eliminate rattles, improve riding qualities and effect a considerable saving in weight and manufacturing costs. Three or more main leaves can be used to take braking and torque reactions.

AMONG the interesting developments tending toward a less expensive and at the same time more satisfactory automotive vehicles is one having to do with the spring suspension system which appears to possess unusual merit. This improvement involves the use of a new type of leaf spring which, it is claimed, can be made lighter than present springs and at the same time give superior riding qualities, especially at light loads. The construction is such that spring shackles as well as spring eyes, bushings and pins are eliminated, consequently there are no parts to wear or rattle and no need for lubrication save that which is considered desirable between the leaves of any conventional spring. This, of course, results in considerable economies in manufacture, not alone because of the spring parts eliminated, but because cheaper frame brackets can be employed, and, at least in some cases, the frame can be cheapened by elimination of certain cross-members. Furthermore, since the spring itself is lighter and requires no eye, it is less expensive to manufacture.

This new development, which is due to Arthur M. Laycock, chief engineer of the Sheldon Axle and Spring Co., involves the use, in most cases, of a compound or double sweep in the plate, instead of a single bend used in conventional leaf springs. This double bend takes care of variations in length which in most conventional springs is the function performed by the shackle. In the semi-elliptic type shown here, however, the main plate is not continuous from end to end of the spring, but at one end is allowed to float a sufficient amount to take care of length variations.

An excellent idea of the characteristic construction employed is conveyed by Fig. 1, which shows a full-elliptic type which has been broken in laboratory tests on the vibratory machine. It will be noted that the two main leaves are continuous from end to end, but have the double bend form. The secondary plates are arranged quite differently than in conventional types, the thickest portion of the spring being at the ends rather than in the center. By this arrangement, it is claimed, the stresses in the steel are more uniformly distributed throughout the mass of the metal than with the conventional arrangement. In sup-

port of this claim it is stated that one test spring shown broke in six places under the influence of the repeated loading imposed by the vibratory machine. These fractures were noted at the same time in all six places and a considerable time before actual breakage occurred. Conventional types usually break at a point close to the anchorage, and the break at first occurs in one leaf only, and then successively in adjacent leaves above or below the original fracture. The type of fracture in several places as shown

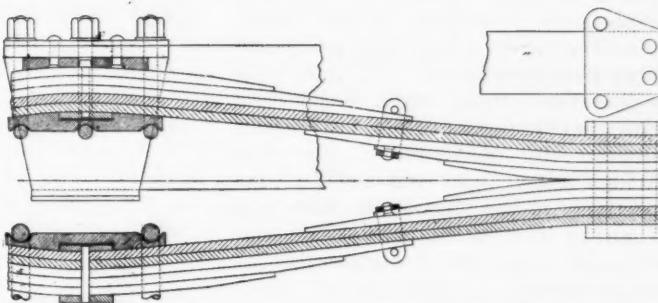


Fig. 2—A design adapted for use on a 5-ton truck

in Fig. 1 is said to be characteristic of all springs embodying the new feature of construction.

If, as some contend, there are advantages from weight and other standpoints obtained by tapering leaves for a considerable proportion of their length, it may be possible in the new type of spring to effect some saving in weight on this score, since it is made up of a larger proportion of short leaves than most other designs, and it is said to be possible commercially, under present quantity production conditions, to taper leaves for only six to seven inches of their length.

The effective length of the new type of spring automatically decreases as the load increases, due to the fact that as the spring is compressed the two halves bear against each other over an increasingly greater proportion of their total length. Because of this fact the deflection is not in direct proportion to the load, but can be made to vary in any desired way by proper shaping of the contact surfaces and the leaves, and consequently the riding qualities can, we are informed, be made as good with light loads as with full loads. Furthermore, it is possible to design a lower vehicle, since it becomes impossible for the spring to close far enough to permit the axle to bump the frame.

Fig. 2 shows a design of spring employed on a five-ton truck in which radius rods and a torque arm are used. The variation in load per in. of deflection is from 1500 lbs. at light loads to 2300 lbs. under heavy load.

The curves in Fig. 3 show the relation between deflection and load for two springs, one of conventional full-

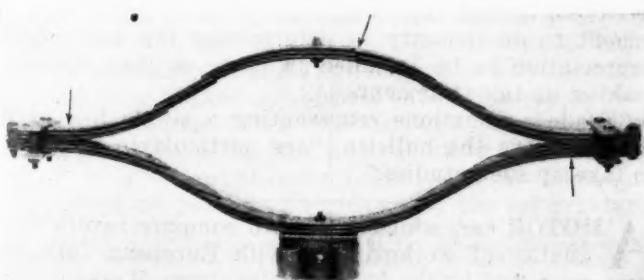


Fig. 1—The new Sheldon full elliptic spring

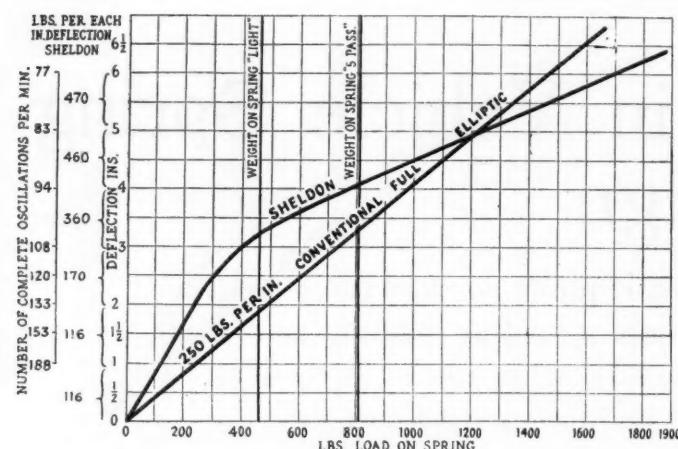


Fig. 3—Curves showing characteristics of new type and conventional type

elliptic type in which the deflection is directly proportional to the load (250 lbs. per in.) throughout the range, and a second of the newer type in which such a relation holds through only the upper and lower portions of the curve, while near the center the relation changes (116 lbs. per in. for first 2 in. and 460 to 470 lb. per in. for the fifth and sixth ins.). The vertical lines on the chart are drawn through abscissa corresponding respectively to weight on the spring when the car is empty and when carrying five passengers. The intercepts of the two curves with these lines show that there is much less difference between the deflection of the two springs under light and full load respectively in the case of the new type of spring than in the case of the conventional type, and consequently the former should be easier riding, especially at light loads. A second scale giving number of complete oscillations per min. plotted at the left shows that the Sheldon spring has a considerably lower period under both light and full load than the normal full elliptic. The particular Sheldon spring shown is, however, too stiff under bumper conditions, but this and other characteristics can be changed by slight changes in design.

A three-quarter elliptic spring of the new Sheldon design is shown in Fig. 4. It is similar in most respects to the full-elliptic design. The half-elliptic design shown

in Fig. 5 differs from the other two in that the main plate is not continuous from end to end. It is bolted rigidly at one end—in the particular spring shown, to the spring horn—while the other end is allowed to float between two other plates held apart by a spacer of slightly greater thickness than the main leaf. The two guiding leaves and the spacer are bolted rigidly to the rear bracket of the spring. The lower half of this bracket is turned up to form a side guide for the free end of the main leaf, and a clip, disposed as shown, serves as a further guide. The main leaf is the only one which extends from the front to the rear bracket. The other leaves are short and are placed in the manner shown.

The bolts which hold the springs of the new type together and fasten them to the brackets are said not to be subjected to shear as a result of flexing the spring under vertical loads. We are informed that the reamer used in finishing the bolt holes will drop through the hole, even when the spring is flexed. Shear is, of course, imposed

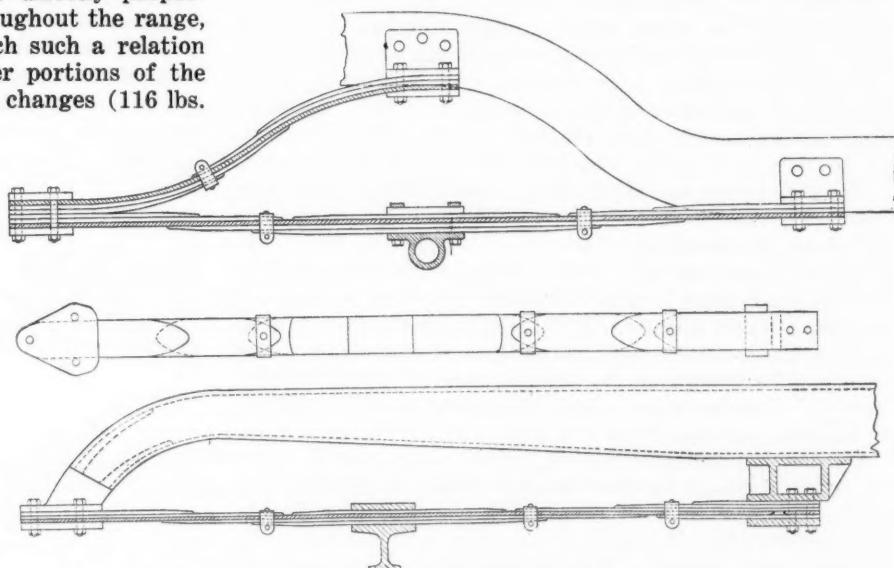


Fig. 4 (Above)—A three-quarter elliptic spring, and Fig. 5 (Below)—A half elliptic spring of the new Sheldon design

by brake and torque reactions, but these reactions are said to add considerable pressure between plates and render the spring unusually stiff in respect to longitudinal deformation. In addition, three or more main leaves can be used to take braking and torque reactions when a torque arm is not employed, thus making it possible to materially strengthen what is often a weak point.

Study of Depreciation Is Urged

PRACTICAL studies by the various industries for the purpose of ascertaining within each industry a normal rate of depreciation shown by experience on buildings, machinery, etc., which may be used as a basis for reckoning depreciation in individual plants is urged by the Fabricated Production Department of the Chamber of Commerce of the United States. Such studies have the approval of the United States Treasury Department.

It is not the purpose to create within any industry an inflexible standard rate of depreciation for the buildings, machinery, etc., of each unit within the industry, but it is proposed to set up something that may be used

tear upon buildings and machinery that are similar in most of the plants within any industry. Another advantage in establishing typical rates, to which attention is called, is that they would prove of as much or more benefit to an industry in determining the accuracy of depreciation to be included in costs as they would in making up tax statements.

"Trade associations representing a single line of industry," says the bulletin, "are particularly well fitted to take up such studies."

A MOTOR car, which is said to compare favorably in quality of workmanship with European cars, has been produced by the Yangtze Machinery Works, China.

Brakes for Automotive Vehicles

A comprehensive survey of present practice in brake design, setting forth the advantages and disadvantages of the various types and discussing factors which enter into the design of brakes and brake actuating mechanisms, especially as applied to passenger cars. Most brakes inadequate.

By J. Edward Schipper*

IN giving so much attention to acceleration we have run somewhat ahead of the other problem that is relatively just as important and just as necessary of solution. This is the problem of deceleration. It should be as much a matter for consideration on the part of the engineer that a car be able to get back to a standing position as it is that the vehicle be able to leap quickly from a standing start to speeds of 10, 25 and 50 m.p.h.

If we were to stop for a moment and take stock of the passenger cars and trucks put out by American builders to-day, we would find qualities of acceleration that are the marvel of the world. On the other hand, we would find qualities of deceleration that many consider to be deplorable. This statement is not made in a haphazard way, but is absolutely warranted by the engineering opinion of those who are responsible for our present-day design. Scores of engineers of the highest standing in the industry have been consulted regarding the subject, in connection with the preparation of this paper, and the opinion is practically unanimous that our present-day brakes, if not the weakest, are assuredly one of the weakest points in design. Whether this is a difficulty that we can rectify under our present system of brake design remains to be seen. The best brakes we have designed under present methods are inadequate in mountainous country, although they serve very well and efficiently in flat and moderately hilly country. When it comes to real mountainous country, however, the engine must be called upon to augment the brakes. Whether or not this is desirable is debatable.

Brakes of the Present

If we turn the problems of acceleration backward and look at them from a deceleration standpoint, we have something of the same nature to deal with. In accelerating we are taking heat energy and transforming it through the mechanism of the car to dynamic energy as represented by the weight of the car and the speed at which it is traveling. This kinetic energy must be dissipated by transforming it back to heat energy through use of the brakes. To bring the vehicle to rest it is necessary to absorb its momentum by making it do work against friction, and this friction produces heat which must be dissipated. The friction brakes act, therefore, by dissipating in the form of heat the energy represented by the momentum of the vehicle. To accomplish this they must produce the heat and radiate it to the atmosphere. It is evident that the radiation of the heat must be as rapid as possible, in order that the temperatures

of the braking parts shall not rise above a safe value for the materials contained in the braking mechanism, particularly at the contact surfaces. Since there is an appreciable time element in the radiating ability of any surface, it is clear that, with the ordinary braking systems, there will only be a certain length of time before the brakes become overheated, because the heat generated is imparted to the brake bands much more rapidly than the heat can be dissipated through the ordinary braking systems now provided. The steeper the grade is, the more quickly the brake temperatures will reach the danger point. Many of the hills encountered in the Allegheny Mountains, for instance, are sufficiently long and steep for this temperature to run above the capacity of the lining to withstand burning, with the result that is all too familiar to engineers. To sum this up in simple language, it is possible to burn out the brakes on a car by using them in going down a long grade, provided the engine is not used to assist the brakes and we depend solely upon the braking system of the car.

Design Factors

When an engineer is laying out the brakes for a passenger car, assuming that he intends to work along the conventional lines, he has several different combinations and types of braking layout available from which to choose. By far the greater majority use two sets of brakes on the rear wheels, these being the internal and the external types, one set being operated by the pedal and the other by the hand lever. This system is used widely because it has the advantage of simplicity and low cost of manufacture, and provided the brakes are laid out with sufficient regard to proper brake area and with the centers of the operating levers arranged so that spring deflection does not cause grabbing or releasing of the brakes, it is fairly satisfactory. In addition to this type of layout, we have the side-by-side internal brakes, which operate on the same drum, this having the advantage of providing two sets of inclosed brakes that are naturally less exposed to water, mud and grit. They are somewhat more complicated in assembly, however; they require a much deeper drawn drum and probably never will be used widely because the complications introduced are not compensated for by any marked advantages in performance.

Another choice which has been favored by an increasing number during the past few years, after first having been used and discarded by several manufacturers, is the installation of the foot or service brake on the rear wheel and the hand brake on the transmission or propeller shaft. This arrangement has the advantage of providing an independent brake drum for emergency use. In case one breaks, it does not affect the other and, furthermore, can be maintained quite easily for repairs if the engine

*Condensed from a paper presented at the Annual Meeting of the Society of Automotive Engineers. Descriptive matter, relating in particular to four-wheel brakes and the Crane transmission brake, which has been found economical in automotive engineering has been omitted.

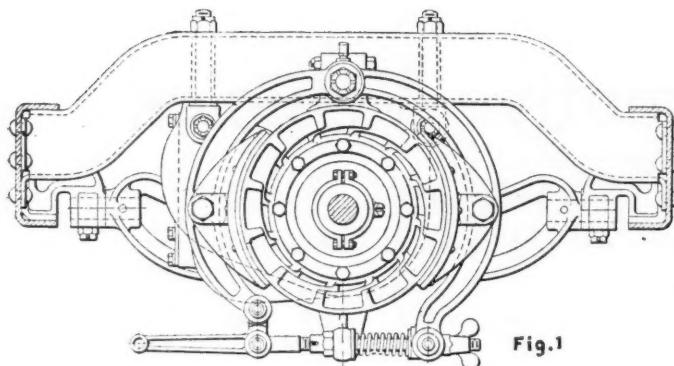


Fig. 1

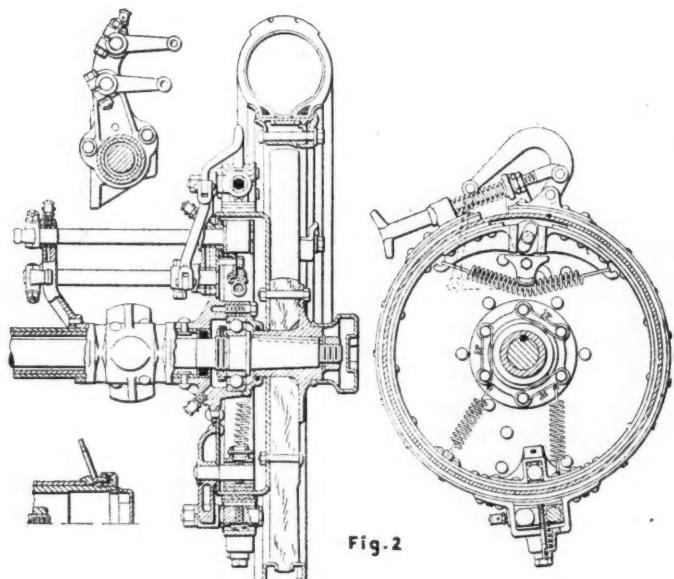


Fig. 2

Fig. 1—Pierce-Arrow truck transmission brake. This brake, which is of the contracting-shoe type, has a drum 12-in. in diameter with a 5-in. face. Fig. 2—Double external and internal brakes used on the Packard single-six car. The Internal brake is cam-operated and substantial release springs are provided to prevent drag

a very powerful emergency braking system. Because of the location of the brake on the propeller shaft, the brake has the benefit of the reduction through the rear driving system and also of the equalization secured by the differential gear. The propeller shaft brake has disadvantages, however; otherwise all manufacturers would use it. The disadvantages that frequently are cited against it are the tendency to chatter, the excessive stresses that must be imparted to the universal joints and rear axle parts and the difficulty of dissipating the tremendous amount of heat absorbed by the small brake drum. Naturally, the size of the brake drum is limited, because of the location of the propeller shaft immediately under the floor boards of the car. Most engineers have been partial to the wheels as being the proper location, because it involves stress in the least number of parts and hence is safer. In worm drive and bevel gear axles, where the spiral angle is fairly steep, many of the pinion and worm shaft bearing failures have been the result of too severe propeller shaft brakes. Overheating of the propeller shaft brake is, of course, the point that is cited most against it.

After having determined the location of the brakes, the engineer has a choice of the flexible band type of brake or the rigid shoe type illustrated in Fig. 1. These again have advantages and disadvantages. The former sometimes has a tendency to grab severely, particularly at high speeds, on account of its wrapping action. With it, however, practically 100 per cent of the brake surface

is effective. With any type of rigid brake shoe it is practically impossible to secure anything like effective surface for the full circumference of the drum. There are two classes of rigid shoe brake: the pivoted or locomotive type and the simple type. In the former a separate brake beam is pivoted to the shoe at its center, so that the entire shoe surface is pressed against the drum. The greatest pressure is found to be under the pivot in this type, the pressure tapering off toward the end. If shoes of this type are made to cover 180 deg. of drum surface, the tips will present practically no pressure and from those points back to the pivot the pressure will gradually increase. This naturally causes unequal wear of the shoe facing and is apt to cause brake squealing. The relatively small area of surface engaged cuts down the friction materially and, consequently, the brake efficiency.

In the simple type of rigid shoe, one end of which is pivoted fast to the spider, the other end being acted upon by the cam, as in Fig. 2, or the toggle, as in Fig. 3, the greatest pressure will be on that part of the lining closest to the fixed pivot and the pressure will taper off to zero at the tip. Unless specific provisions are made to the contrary, the movement of such a shoe will vary as the distance from the pivot, so that the portion of the lining closest to the pivot will have the greatest pressure if it is brought into contact with the drum, and still have so little movement that it may not establish the desired amount of contact and hence be ineffective. On the other hand, the portion of the brake near the other end of the shoe, being at the distance most remote from the fulcrum point, will have but very little pressure on the drum, the pressure it obtains being all from the direct action of the cam or toggle. To give full contact area, brake linings should be cut back from the end of the shoe.

A band brake, examples of which are shown in Figs. 4 and 5, will give practically 100 per cent surface contact, which, of course, is highly advantageous not only from the standpoint of effectiveness but from the standpoint of quietness in the brake action and the life of the lining. It is a well-established fact that brake squeal is due largely to concentration of the braking pressure on limited areas of braking surface. These high spots or contact points, being highly stressed, are caused to chatter and set up vibrations. There are many band brakes in use to-day which, although designed primarily on the contracting band principle, do not really work out in this way. Instead of causing the operating levers of the brake shoe to draw the band down snugly over the entire surface of the drum, the construction of the brake toggles is such as simply to bring great pressure on the few inches of the brake band nearest the toggle, and the rest of the brake shoe, which probably represents nearly 75 per cent of the possible braking area, is doing very little or no work.

External brakes for passenger cars can be used with lighter drums than internal brakes because the expansion of the drum, due to heating, does not reduce but rather increases the power; whereas, internal brakes have insufficient travel on the levers to follow up the increased circumference. Neither does the distortion of a thin drum noticeably affect the power of the brake in contrast with internal brakes which, except in the wrap-up internal type, rarely fill the circumference of the drum, and especially in the case of internal shoe brakes where practically no more than half of the drum circumference is utilized. In such cases the drum must be stiffened or ribbed to minimize distortion. Exposure to dirt and sometimes a rather unsightly appearance are objectionable features of the external brake. The cheapness of manufacture and upkeep has been respon-

sible largely for the popularity of this type of brake on passenger vehicles. The external brake is, of course, very accessible. Consequently, it is used as the foot brake because of the relative ease of relining and to reduce the cost of upkeep.

Uniform and Effective Braking Power

To secure uniform and effective braking power the operating levers of the brake should be of such construction as to not only draw the brake band against the entire surface of the drum, but the operating principle should be such as to draw this brake shoe band down with uniform pressure on the brake drum. If, when the brake pedal is pressed down and the operating levers of the brake shoe begin to tighten, the pressure of the brake shoe is 50 per cent more on one side of the drum than on the other, it is obvious that the effectiveness of the brake has been lowered greatly, and the condition created that is apt to cause the squeal that is giving so many builders of cars much anxiety at present.

It will sometimes be found that brake band linings are not worn at the ends where the toggles are, or at the hinge point to a perceptible extent, but that they are worn through to the steel at a point about one-half way between the hinge of the brake and the operating toggles. This condition is due purely to an imperfect arc of a steel band. The band either has been bent or sprung, or it never was shaped up so as to conform to the circumference of the brake drum against which it was intended to work. Another point of weakness is that when the adjustment of the brake is too close to the drum the blowing in of sand on a sandy, dirty road can create objectionable friction between the surfaces of the brake shoe and the drum. There is no perceptible drag while the car is clean, but as soon as a sandy type of road is encountered, considerable drag is introduced.

Drag is due also to insufficient strength of the releasing mechanism; or the action of the brake may not be adequate to insure a proper release of the brake band from the drum when the brake pedal is released by the driver, as shown in Fig. 2. When the car is new, it may work very nicely; however, traveling in the dust and mud of the road for some months often has the effect of causing the parts to work heavily. It is not uncommon for the springs used to release the brake shoes to prove inadequate for their work, and this results in a drag on the car, premature wear on the face of the shoe and often the generating of sufficient heat to blister the paint on the brake drum. A brake drum should be very well fitted and run true. Many brake drums run out over 1/64 in. and, as the clearance between the liner and the brake drum is generally less than this amount, the brake lining is in frequent cases rubbing continuously.

Exposed and Protected Types

From the standpoint of heat radiation, the exposed type of brake is evidently best on account of the ability to secure air circulation and consequently more rapid heat dissipation. Unfortunately, however, especially on rear-wheel applications, the open type of brake is subject to the severe drawback of exposure to water, dust and grit. Because of the composition of the brake linings, which are heat-resisters primarily, practically all of the radiation is from the drum and, naturally, the

most efficient radiation is secured when the entire outer surface of the drum is exposed to the air. With reference to heat radiation from the drum, it would be very hard to imagine any worse condition possible than that obtained in the conventional internal and external types of brakes used on the majority of passenger cars and on many of the lighter trucks. No more efficient insulation could be imagined than the two asbestos linings, one applied within the inner and the other on the external surface of the drum, when both sets of brakes are engaged. For normal driving over level country, such a system is all that is necessary, of course, because the length of time of brake application is insufficient to raise the temperature of the drum beyond a safe value. On the other hand, as soon as cars equipped with brakes of this type attempt to negotiate any long, steep hills, relying on their brakes alone, they get into trouble. In other words, it is perfectly possible to burn out the brakes on even the best of our passenger cars on a trip, say, over the Lincoln Highway from Philadelphia to Pitts-

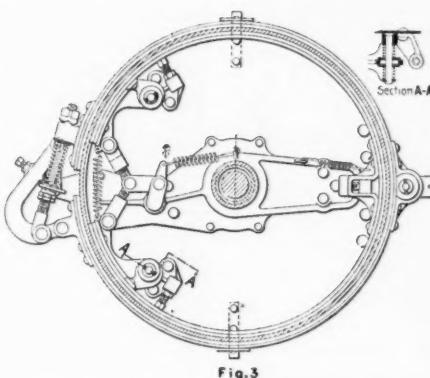


Fig. 3

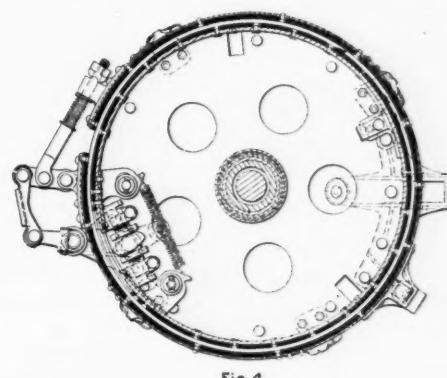


Fig. 4

Fig. 3—Internal and external brakes used on the Lafayette car. The external-contracting band brake is operated by a bell-crank and the internal-expanding brake is actuated by a double-adjustable toggle. Fig. 4—Double internal and external brakes used on the Marmon car. This is a cam-operated internal-expanding brake which is anchored in the usual way with a bell-crank-operated contracting-band type on the same drum

burgh, where the long, steep grades of the Allegheny Mountains must be encountered. The motorist has only one resource and that is to use his engine for a brake. If he fails to do this, or does not know how to do it, his brakes will fail.

Side-by-side internal brakes, which allow the external surface of the brake drum to be exposed and, consequently, permit more rapid radiation, are only a partial solution of this problem. The brake drum becomes heated upon the application of one set of brakes for any considerable length of time, of course, and there is no great advantage in being able to alternate the use of the two braking systems, since both sets in use are compelled to operate against the same hot drum. Another drawback to the double internal brake is that, unless the manufacturer has been unusually careful, there is a tendency to sacrifice brake shoe widths on this type of brake layout to accommodate the widths of the drum without getting too deep a brake drum flange, which, of course, requires an exceptionally deep draw in manufacturing the drum. Two concentric drums on each wheel would separate the two braking systems entirely from each other, of course, but introduce complications that lead to rattles and possibly even structural weakness. Furthermore, the inner drum is apt to be of insufficient diameter and, consequently, the inner brake of insufficient surface area. It is very difficult to design a brake of this kind that is not too light to have sufficient strength and still be crowded into the necessarily confined space provided. In addition, the inner brakes will

be very apt to have insufficient radiating surface on account of the insulating effect of the outer brakes. To obviate the use of the single drum for the two sets of brakes, one is forced to consider the propeller shaft brake, or front wheel brakes, of which more will be said later.

Brake-Actuating Means

The placing of the service and the emergency brakes on the inside of the drum has an advantage in the greater protection from dirt, but in this case both sets of brakes have to be cam-actuated. Where only one internal brake is used, the toggle construction can be utilized.

Brake actuating means are so well known that there is no need of discussing them in this paper. The practice on the external contracting type is practically universally in favor of the pivot anchor directly opposite

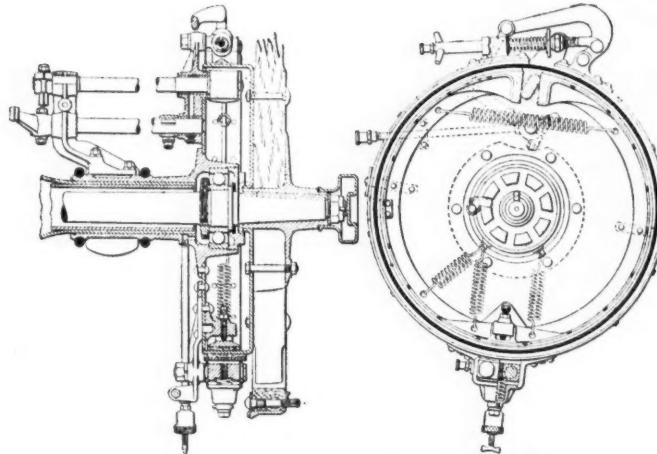


Fig. 5—Double internal and external expanding band type of brake used on the Packard twin-six car, the former being cam-operated

the contracting mechanism. The brake segments are formed with eyes for the anchorage joint or the steel bands have a fitting that is riveted to them to serve the same purpose. The brake support consists of a bracket secured to the rear axle tube or to the radius rod. The contracting mechanism is nearly always a floating bell crank lever similar to that shown in Fig. 3, to the short arm of which one end of the brake band is connected by a riveted bracket, while the other end of the band connects through a short link to the fulcrum of the bell crank. The operating rod is connected to the long arm of the bell crank. The short link is hinged to the free end of the brake band and passes through the fulcrum pin, the bell crank being forked at the lower end. A butterfly nut is screwed over the end of the link and provides a convenient adjustment. The adjustment is locked by the spring surrounding the link, which forces the arms of the bell crank over the flat end of the wing nut, thus preventing it from turning. The coil springs help at the same time to release the band when the pressure is taken off the brake lever. This method, while offering a simple and efficient means of applying the brakes, has also the advantage of providing a simple adjustment means.

The operating means for expanding brakes are of four types; the cam as shown in Fig. 5, the toggle illustrated in Fig. 3, the wedge and the double-arm lever. In the cam type the internal shoes are pivoted opposite the expanding point. An expanding cam is placed between two flat surfaces or is contoured to fit a follower surface that permits spreading the shoes apart to secure their contact with the drum. The toggle expanding mechanism also is employed very frequently. In this the ends of

the brake segments are connected by a pair of toggle-links from the joints of which another link runs to a bell crank whose shaft has a bearing in the brake supporting bracket. Sometimes one or both of the toggle links are adjustable. The toggle mechanism and the cam both have the advantage that they afford quick engagement at first, and then a slower engagement as the movement progresses. In other words, a greater leverage is obtained when desired and so is greater speed. The wedge expander is simply the action of a wedge that is forced between the two ends of the segments, spreading them apart in the same way as the cam, and the double-arm mechanism consists simply of two levers that throw over a center, forcing the ends of the segments apart when actuated.

Little need be said regarding brake releasing except that the anti-drag features on brakes should be sufficiently strong to free the bands or shoes from the drum positively on disengagement. There are too many instances of dragging brakes, due to having these made too weak for the purpose. The type of brake adjustment selected will, of course, depend on the design of the brake-operating mechanism. With some types of mechanism, such as the cam expanders used in internal expanding brakes, these adjustments are difficult to make. However, the question of adjustment is one of a detailed nature that is of great consequence in one or two particulars. In the first place, the adjustment should be extremely accessible so that the owner can adjust his own brakes, or, if he needs to have them adjusted, so that his bill for this work will be as small as possible. Another important matter regarding brake adjustment is that it should be arranged so as to preclude much possibility of upsetting the layout of brake centers when it is made. It is very encouraging to note that there is a marked tendency to increase the diameter of the brake-drums even on the lighter cars. We have always had fairly good-sized brakes on our heavier and more expensive cars, but it is well known that this is a feature that has been neglected on the light and medium-weight cars, particularly those which sell for a low price. Few, if any, brake-drum sizes have been worked out by formula. Most of them have been made by guesswork at the start and increased gradually as complaints come in from owners and dealers as to the braking ability of the cars.

Formula for Brake-Drum Size

I have checked a formula that was worked out by a passenger car engineer who had given the subject considerable attention. It gives results that are very good in the light of present accepted practice. The formula is

$$d = [(Wf \div 2w) + 1.5] \div \pi$$

where

d = Diameter of the brake-drum in inches

f = Factor of 0.045 sq. in., or the total effective service-brake surface per pound of the maximum weight of car

W = Maximum weight of car and load in pounds

w = Assumed width of brake in inches

1.5 = Allowance for clearance between the ends of the brake-lining

Applying the formula to the Ford car and assuming the total weight to be 2500 lb. with passengers and a $1\frac{1}{2}$ -in. width of brake band, it will give a drum diameter of 12.4 in. or, say $12\frac{1}{2}$ in. This would be about correct for this size of car. Applying this formula to a large, closed car having a weight with passengers of say 6000 lb. and a $2\frac{1}{2}$ -in. width of brake band, it would give a $17\frac{1}{2}$ -in. diameter of brake drum.

A brake exercises its maximum efficiency when it is just short of locking the wheels. This has been demon-

strated in railroad practice and is well known by experienced drivers.

It will be interesting to note what is considered good braking in the ordinary rear-wheel-brake application in stopping a vehicle. Table 1 has been taken from a test made on a car which, with passengers, weighed close to 4000 lb.

TABLE 1—REAR-WHEEL BRAKE STOPPAGE-ABILITY

Speed, m.p.h.	Distance Required for Stop on Actual Test, ft.—in.	Standard Given by Thermod Rubber Co., ft.—in.
10	9—0	9—2.4
20	34—11	37—0.0
25	53—7	58—0.0
30	74—5	83—3.6
40	135—6	148—0.0
50	178—0	231—0.0

An allowance of 17 lb. of car-weight per sq. in. of brake area can be recommended for light and medium-weight cars; 20 lb. for heavier cars, and 30 to 50 lb. for medium and heavy trucks. Although the diameter of the brake is the main consideration in determining the holding power, since it determines the braking or retarding leverage, the width of the brake is a highly important factor. On the other hand, engineers should not be misled into putting too great a width on the brake, because of the difficulty to secure a full contact between the linings and the drum when the brake is new or when the lining is replaced. The engineer who recommends the formula presented, after having determined the size of the drum (assuming that he is designing an internal contracting brake), lays out the contracting mechanism so that the operating lever hangs down and the pull on it is in the opposite direction to that of the torque reaction. After having located properly the center of the eye of the operating lever as near the center of the torque-reaction circle as possible to keep the brakes from grabbing, the linkage is then laid out to produce a 30-lb. pedal-pressure to lock the wheels.

Brake Operating Mechanisms

The linkage ratio generally is determined finally by experimenting. So far as we know, there is no formula that is reliable enough to recommend. Tentative linkage-ratios are first determined by assuming a 5-in. stroke at the pedal and juggling this with the stroke of the lever that operates the contracting mechanism on the drum, as determined by the layout. The cross-shaft location and the location of the center line of the eyes of the levers on the cross-shaft can be determined by making a half-size wood model of the main leaf of the rear spring, and this is fastened to the drawing on the board by wooden pins and shackles representing actual conditions. Fastened to the wooden single-leaf spring is a simulation of the rear-axle with the location of the brake operating-lever eyes. The model is then moved upward and downward a distance representing the maximum deflection of the spring. The curve of the movement of the lever eye is then easily plotted; the curve for torque reaction also can be plotted; and from these data it is easy to determine accurately the proper location of the centers of the eyes to the levers on the cross-shaft. This layout can be checked experimentally by bolting a metal shield to the frame of the car between it and the brake-drum, to which drawing paper is glued. Pencils, held against the paper by spring plungers, are located in the same planes as the operating-lever eyes and, when the car is driven, trace the actual movement of the lever eyes for torque reaction and spring deflection. These curves are then checked against the curves determined on the drawing-board layout and the levers and their locations are then determined finally. The

engineer who uses this method states that it has never failed to produce a good braking system.

The subject of proper layout for the brake linkage is a large one in itself. This matter was covered very fully in a paper on the Correct Location of Brake Levers, by Walter C. Baker. With the Hotchkiss drive this is a very important matter, and is now receiving the consideration it deserves, although a few car builders have realized the importance of it for some time. It is a fact, however, that an alarming percentage of automobiles having the Hotchkiss type of drive gives a very unsatisfactory brake action over a rough road. I have noticed some extreme cases where the links have been far off from the desired center. In one particular instance, when driving a certain car not long ago, the pedal moved through 3 or 4 in. of travel when running over extremely rough roads, and actually applied the brakes. When attempting to apply the brakes over roads of this kind, the wheels would alternately lock and release as the obstructions in the road were encountered, causing a tremendous chatter to be set up that not only made driving very unpleasant, but was extremely hard on the tires as well as on the entire structure of the car. Mr. Baker described in his paper the use of a simple measuring device that permitted locating the proper center for the link-eyes. This center should coincide with the center of torque rotation and the center of spring flexure so that little or no pedal action can be caused, either by the flexure of the springs or by the torque reactions in the rear axle tube to which the brake support is connected.

An important point that should be taken into consideration in determining the position of the operating levers is that the pulling levers should all be arranged so that they will start in the longest position, or at approximately 90 deg. in relation to the rod, and end their movement at the shortest radius and with angles greater than 90 deg. The pulled levers are arranged to start operating at their shortest radius and end their movement at the longest radius with an angle of approximately 90 deg. when the brakes are applied. There is a general belief that the best results can be obtained by the use of brake-rods having front joints that are as nearly as possible in line with the front pivot of the radius-rods or torsion-tube, where used, or with the front spring-eye of the rear spring in the Hotchkiss-drive arrangement. Good results can be obtained when the rear ends of the rods are joined to brake levers at the back of the axle, instead of at the front. In this position, the radius of their motion is longer and, consequently, the chord of the arc through which they travel in response to spring action is flatter, producing less push-and-pull effect. This position sometimes has the advantage of placing the rear ends of the rods where they are more accessible for adjustment. To emphasize this point of adjustment it must be pointed out that poor adjustments often will spoil a good brake-layout. The burden of blame, however, should be borne by the designer, because of his failure to provide adjustments that are more nearly fool-proof. The brake adjustment means should be simple and accessible so that the operator can keep the brakes properly set up. It should be possible to take up wear on a brake by hand, without the use of any tools, the adjustment being made so as to be self-locking and proof against loosening from vibration or road shocks.

Brake Equalizers

Regarding brake equalizers, there are two directly opposite schools; one believes that brakes cannot be equalized commercially, and the other uses brake equal-

izers as stock practice only on the service brake, generally, but sometimes on both. The reasons given by both sides are interesting and cast some light on the entire question of brake-linkage layout. Some of those who do not use equalizers believe in equalization, but think that it is secured inherently in the mechanism that they employ, without a special equalizer-bar. Equalization is secured by some of the companies through use of cross-shafts that are sufficiently long and flexible to spring enough to distribute the pressure. This has the advantage that in case rods, pins or any parts break or become loose on one side, it will not cause the other brake to be inoperative. An interesting reason that has been cited against the use of equalizers is that if they are not used and if oil collects on any one of the brakes and then the brakes are applied, greater braking is received from this wheel than if an equalizer were used. There is doubtless a great amount of difficulty in getting equalizers to work so that they will be absolutely certain. For this reason they have not been used by many firms. One builder states that it is possible to obtain a set of equalizers that work perfectly before the car is painted and never work afterwards, or be very satisfactory after the car is painted but go out of commission after the first piece of dirt gets into the brake-shaft bearing.

The question comes back to whether the equalizer can be made a commercial proposition. There is no doubt that a perfectly equalized brake is better than one that is not equalized, the matter being more of a commercial one as to whether brakes can be equalized so that they will remain so under service conditions. Of course, without equalizers it is absolutely essential that a very careful adjustment be made in the brakes so as to have both take hold with equal strength. When cars are not equipped with equalizers, there is a tendency for a brake to take hold at one wheel only if the adjustment is not proper. The result is that this wheel is often swung toward the center line of the axis of the car. In other words, if the brake that holds be the rear right brake, the rear end of the car would have a tendency to swing to the left, an action that is dangerous at high speed or over slippery roads.

The Pro and Con of Equalizers

Some of the constructions of the equalizing bars are very ingenious. They must be made rattle-proof but at the same time capable of taking all the stresses of brake application without noise. One company in the low-priced field uses two equalizing bars as well as four pull-back springs hooked to the rear axle. The result has been a low-priced installation, particularly in view of the fact that it has been necessary to run the brake leverage inside the frame with this design. It has been found economical by some to put the equalizer on the rear axle. This eliminates the necessity of having to employ a more extensive construction near the center of the car. One of the best compensating devices is a special differential gear that has been used for years on the Rolls-Royce and has been seen on one of the higher-priced American cars brought out within the last two or three years.

When all phases of the matter are considered, it is found possible to get good results with either equalized or unequalized brakes. The question is really one of commercial practice rather than actual mechanical preference. An objection to unequalized brakes is that if the connections to the brake on one side are a little stiffer than the connections to that on the other side, the brake on the freer side will release before that on the tight side, tending to cause skidding. This condition is in rare cases so exaggerated that the freer side will release enough to allow the pedal to come back to the stop

without releasing the tight brake. This naturally will cause the dragging of one brake, with an increased fuel consumption and unnecessary wear on the bands.

Some recent installations of cable equalizers are interesting. Care should be taken against stretch and excessive back-lash. The entire question of equalization must be solved by individual preference, for there is much to be said on both sides and it is feasible to get good results either with or without equalizers. It is possible to prevent rattle in any case throughout the entire linkage by the careful installation of take-up springs which keep the linkage under tension at all times.

Brake Linings

There are some qualities of brake lining that should be taken into consideration. Good results cannot be expected from any brake lining unless the brakes are designed so as to allow its good qualities to assert themselves. It is unfair to expect any brake lining to give good results when the brake design is such that it is impossible for the heat generated in deceleration to be dissipated. It must be remembered that the coefficient of friction of brake lining is different when the brakes are cool from what it is when they are hot. This has been demonstrated very effectively by the Bureau of Standards which, in co-operation with the Motor Transport Corps and the Society of Automotive Engineers, has made extensive tests of brake lining materials. Many of these have been published. One interesting fact was demonstrated regarding the coefficient of friction. During the long-time runs with cooled drums, the coefficient remains more nearly constant than during hot tests. The average value of the coefficients of a number of samples of brake linings was nearly 0.40. In some places it was as low as 0.30, while in a few samples only was the average over 0.50. The extreme values of the coefficients were approximately 0.28 and 0.60. The effect of leakage of oil to the brake shoes was demonstrated in these tests by saturating samples of the lining with oil and then noting the coefficient of friction. A few samples saturated with oil and with oil constantly supplied showed a coefficient between 0.10 and 0.20. After discontinuing the supply of oil, the coefficient rose in from 15 to 30 min. to values between 0.20 and 0.30 and was then maintained steadily. The question of how much brake area a car should have is one that has been given considerable attention since the tests mentioned were made. One prominent manufacturer of brake lining states that a car should have a brake with a surface equal to 1 sq. in. for every 17 lb. of car weight. This alludes to the actual surface of brake lining that should be used.

As a general matter, it can be stated that the prevailing view among brake lining manufacturers is that the average passenger car and truck is under-braked and, consequently, that too severe stresses are being placed upon the lining and exaggerated requirements exacted. Looking at the matter from the other side of the picture, one prominent engineer in the passenger-car field states that he believes there is much room for improvement in brake linings. Most of them are woven very loosely and are compressed easily, he says, "so that the brakes frequently must be taken up on account of the great pressure exerted on the brake shoes compressing the woven asbestos, rather than because of actual wear that has taken place."

The Engine As a Brake

It must be admitted frankly that the heat-dissipating qualities of our present braking systems are not sufficient to care for the extreme load of mountain driving.

To come through safely, we must use the engine as a brake. If this is acceptable and desirable, there is little more to be said; because, by using the engine as a brake, the braking system can be nursed carefully so that it will not be worn out in an unduly short period of time. If, on the other hand, the procedure is unsatisfactory and we should have a braking system independent of the engine, we are driven to other methods. It should be stated that if automobile and truck designers expect the engine to be used as a brake, the elements receiving the braking stresses, such as the universal joints and power-transmission parts in both the gearset and the rear axle, should be designed accordingly. It is necessary only to stand at the foot of the hill on the New Jersey side of the ferry from Dyckman Street, New York City, or at the foot of any of the long, steep hills around Pittsburgh, and listen to the squealing of dry and overheated clutch and transmission bearings to realize that there are many instances in which the engine and transmission system is not adapted to taking the braking stresses.

Four-Wheel and Front-Wheel Brakes

The four-wheel brake offers some very interesting possibilities for both passenger cars and trucks. The chief criticism that has been directed against it is its complications. Whether this will be sufficient to kill the idea remains to be seen. I believe that within the next five years we will find a very marked increase in the use of this system of brakes. With a braking system in which all four wheels are equipped with brake drums, the brakes being applied simultaneously by the service-brake pedal, and an emergency brake on the propeller shaft, it would seem that a very efficient layout could be obtained. We are limited in braking ability by the frictional contact between the tires and the ground. There are four points of contact and, if all four wheels were locked, a total braking drawbar-drag of a fixed quantity would be available to stop the car. This quantity is different for every condition of the ground but, inasmuch as the car weight can be stated as being approximately 60 per cent on the rear and 40 per cent on the front wheels, if we add the two front wheels to our braking equipment, we increase the braking possibilities by 66 per cent; or, to put it in another way, we reduce the amount of heat that must be dissipated through the rear drums by a like amount, in bringing the car to a stop. This reduction can be made in either the time or the temperature factor, provided we are bringing the car to a stop within a definite distance or in the shortest possible time.

There is no doubt about the increased efficiency of braking with four-wheel brakes. The tendency to skid is recognized to be less, and the question simmers down to whether the additional complication necessary is compensated by the increased braking ability. It is a fact that the use of front-wheel brakes would tend to reduce the number of accidents due to skidding. They would be well justified even at a slight increase in the cost of manufacture and in spite of the added complication. With the present heavy traffic in all cities it is not unusual for 100 or more vehicles to suffer skidding accidents during the morning or evening rush hours. In the first light snowfall of 1921 in Detroit I counted 10 cars, during a single trip downtown, that had suffered rear-wheel fracture due to skidding over the slippery paved streets into the curbs. If front-wheel brakes would tend to cure this situation, as well as to increase the safety of both pedestrians and vehicles during wet and slippery weather, they should be carefully considered by the industry, which must hold itself responsible for all accidents due to imperfection of design. In hilly cities, such as Pittsburgh, the number of skidding acci-

dents in wet weather is tremendous, in spite of the fact that cinders are spread on nearly all of the bad curves and grades to prevent these accidents. It is useless to say that operators should not drive at 20 to 35 m.p.h. down these wet and icy hills and then try to stop suddenly. If they do drive that way and are within the law, it is incumbent upon the industry to provide brakes that will meet the conditions if it is possible to do so.

It is possible to operate four-wheel brakes mechanically, hydraulically, pneumatically or electrically. All these methods have been tried with varying degrees of success. The hydraulic system probably shows the greatest promise at present because of its simplicity and also from the standpoint of perfect equalization. It has received one marked criticism in that failure of one of the pipes throws the entire system out of order. However, with a suitable large transmission brake as emergency equipment, this objection is largely overcome.

A criticism of some weight that has been offered on front-wheel brakes is the tendency to go into a front-wheel skid; but this fault can be overcome. The front-wheel skid is caused by attempting to steer the car when the brakes are applied. It is apt to occur, for instance, in going into a curve at high speed and attempting to check the speed suddenly. The dragging action of the front wheels on the ground, enhanced by the angle at which the wheels are turning in steering, will throw the car into a front-wheel skid if the ground is at all slippery, or covered with a loose and non-adhering top-dressing. A remedy for this is to make the rear-wheel brakes slightly more powerful than the front-wheel brakes.

Truck Brakes

On truck brakes, the following statements have been made by an engineer specializing in this work and seem to represent what is considered good practice.

- (1) Truck brakes should be designed in terms of truck weight in pounds per square inch of lining. This has, of course, a distinct bearing upon the durability of linings. It is a very much neglected factor in some designs. A weight of from 30 to 50 lb. per sq. in. of lining for a hand-brake on the rear wheels gives satisfactory results. For a foot-brake applied to the transmission, a greater value can be used, namely, 100 to 150 lb. per sq. in. In both cases a smaller value is much to be preferred; in fact, the lower this can be kept the better.
- (2) The average brake lining will give the best results provided the pressure does not exceed 100 lb. per sq. in.; as in item (1), the lower the pressure is, the better the results become.
- (3) Calculations should be made for leverage on a value of about 26 to 1 for the transmission brake; 50 to 1 for the hand-brake on the rear wheels; and 20 to 1 for the foot-brake on the rear or the front wheels; these values have been found through experience to be very satisfactory.
- (4) The average man can exert a pressure of approximately 200 lb. on a pedal and about a 100-lb. pull on a lever. It should be remembered that 75-per cent efficiency for linkage is a high figure in view of the fact that the joints invariably lack lubricant and therefore stick.
- (5) Other important values are 0.25 for the coefficient of friction of fabric and 0.50 for the coefficient of friction of the tire on the road.

A NEW course in aviation has been added to the curriculum of the Research University in Washington. Special attention is paid to airplane engines and the course has appealed to many automobile mechanics who have become interested in this type of engines. Both resident and correspondence courses are offered.

France Tests Trucks and Tractors for Military Service

Three types entered in trials to determine on what makes subsidies shall be granted. Classes included agricultural tractors for hauling 155 mm. guns; 7½ ton trucks for carrying light tanks and four-wheel drive artillery tractors for pulling 15 and 20 ton loads. Three makes fail.

By W. F. Bradley

FRANCE having decided to motorize her entire artillery service, has just completed a series of trials to ascertain what makes of trucks and tractors shall be granted State subsidies. As in the past, it is desired to develop types of vehicles which, while suitable for agricultural or business purposes, can also be used to advantage by the army in case of war, thus making it unnecessary for the Government to maintain big fleets which will be little used and will be costly to keep up. In order to attain this end the Government offers purchase and maintenance subsidies to the owners of trucks and tractors meeting with its requirements.

The trials just brought to a close were for three distinct types: agricultural tractors to be used for hauling 155 mm. guns across country; 7½-ton trucks for carrying light tanks, and four-wheel drive artillery tractors pulling 15 and 20-ton loads and capable of operating over good roads and across country to a certain extent.

Only Four-Wheel Drive Admitted

Because the army would admit only four-wheel drive and creeper band agricultural tractors, the competitors in this class were reduced to Renault, Peugeot, Pavesi and Blum-Latil, each with two machines. The Renaults and the Peugeots are creeper band purely agricultural type tractors, with four-cylinder engines; the Pavesi is a four-wheel-driver, with a twin-cylinder horizontal engine and metal wheels, and is also a purely agricultural type. The Blum-Latil differs from the others by being a road tractor with semi-elliptic springs and rubber-shod driving wheels.

In order to test the suitability of these tractors for artillery service, each one was kept at work for fifteen days on prepared tracks on the artillery camp, near Versailles, where they had to haul a 155 mm. gun, on a four-wheel gun carriage, weighing about 4 tons. The conditions were such as would be met with in actual warfare, for the tracks comprised thick mud, short, steep gradients, shallow trenches and a certain amount of haulage over hard roads. Over an average cross-country stretch the tractors had to show a speed of 3.1 miles an hour, while the stunt performances comprised longitudinal stability on a 40 per cent gradient and lateral stability on a 70 per cent gradient.

The Renault, Peugeot and Pavesi machines gave equal performances. Greatest interest lay in the Blum-Latil machine which, although not an agricultural tractor, met the technical requirements, and, consequently, was eligible to start in the competition. This machine

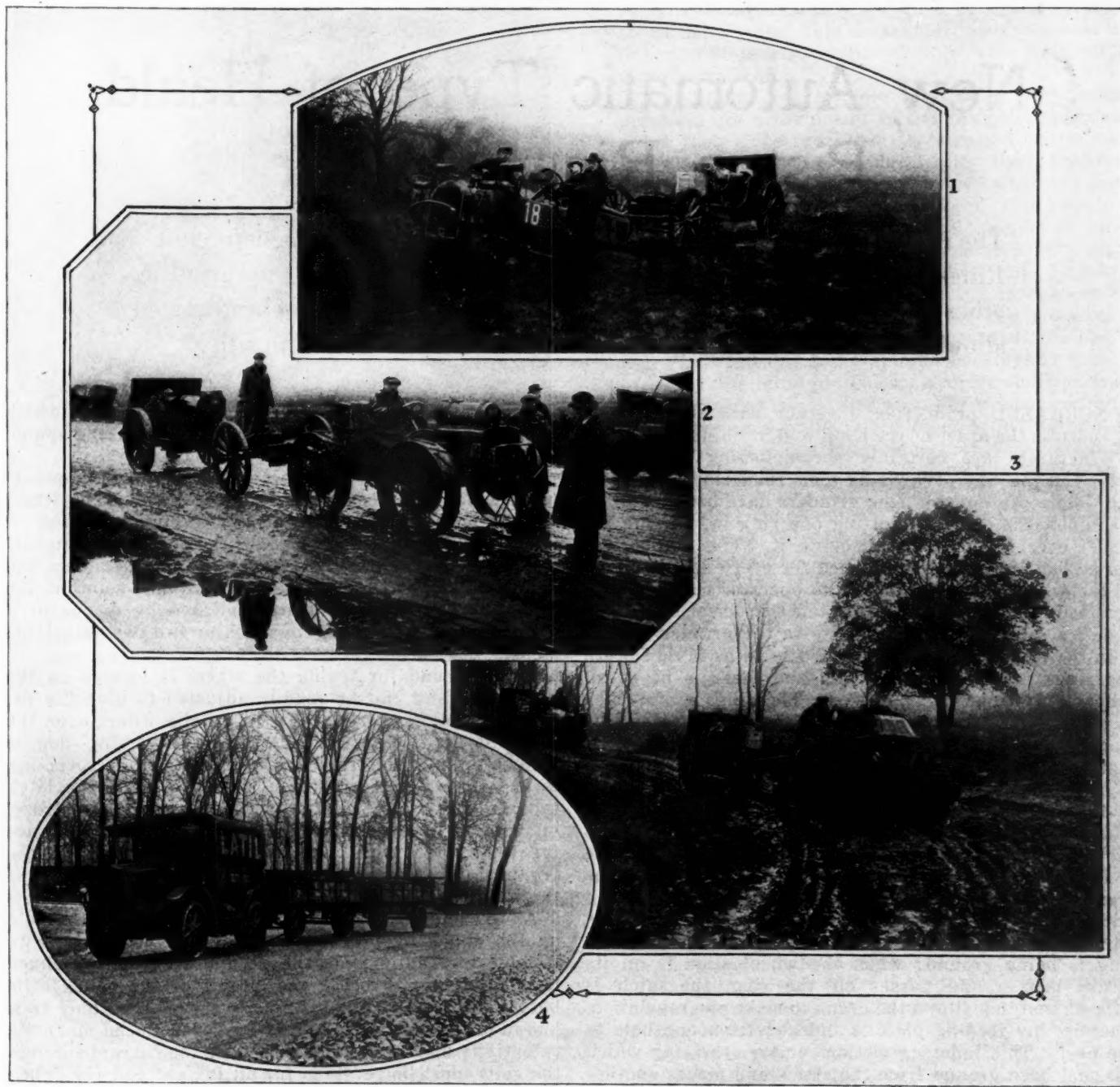
proved itself equal to the others for general haulage across country and over mud roads, but owing to its higher center of gravity was unable to meet the requirements regarding lateral stability. When working on soft roads, or away from made roads, chains were used on all four wheels, but under similar conditions the Pavesi agricultural tractor was obliged to fit four or five stakes to each of its wheels. Under very heavy going the speed of the machines was practically equal, but on normal cross-country work the wheel type tractors were faster than the creeper band machines, and as soon as hard roads were reached the Blum-Latil had an immense advantage.

Having fulfilled the road tests the four makes of tractors are being stripped for a close technical examination, which will determine whether they are to be accepted as artillery types and be given the advantage of a State subsidy.

Berliet, Renault and Dewald entered in the 7½-ton truck competition, each maker having two vehicles. This type of truck is required by the French army for the rapid transportation of light Renault tanks, which weigh, together with their crew and all equipment, from 7 to 7½ tons. Although a truck of this capacity is not extensively employed in France, there is nothing in the military regulations which would mitigate against its general use. Designers are given a very free hand, the only important restrictions being in the body space, which must be equal to 148 by 78 in., in order to receive a tank.

How Various Makes Performed

The two Berliets had to be withdrawn during the first days of the trials owing to a defect showing up in the frame members. The two Renaults and the two Dewalds went through the trials in a satisfactory manner and doubtless will get the Government subsidy. The trucks had to carry the full load of 7½ tons, in the form of a Renault tank and munitions, for fifteen consecutive days, and to average 6.2 miles an hour on each day's run. Only hard roads had to be covered, but the routes were selected so as to throw in as many hills as possible. These two types are of entirely different design. The Dewald has a four-cylinder 4.3 x 5.9-in. engine, under a hood, four-speed gearset and final drive by side chains, its total weight being only 9940 lb., with body, water, gasoline and tools. The Renault has a four-cylinder 4.8 x 6.3-in. motor, radiator behind the engine, four-speed gearbox, live axle and final reduction by planetary gears in the rear wheel hubs. Its weight in running order, without load, is 12,880 lb.



1—Peugeot crawler band tractor hauling gun across country in French military trials. 2—Pavesi four-wheel drive agricultural tractor hauling 155 mm. gun. 3—Renault and Peugeot crawler band tractors hauling 155 mm. guns. 4—Latil four-wheel drive 20-ton artillery tractor

Renault and Blum-Latil were the only competitors in the 20-ton four-wheel drive tractor class. These machines failed to give the results that were expected of them. A cylinder block had to be changed; a connecting rod bearing burned out; the brakes failed to hold on one of the hill tests and the tractor narrowly escaped turning over; there was gearbox trouble; some of the test hills were not climbed and the average speed of 6.2 miles an hour was not observed on several occasions. The poor results in this class is all the more surprising in view of the fact that these tractors were used to a considerable extent by the French Army during the war and are a well-established type. The tractors never had to leave hard roads, but gradients were found, with rough granite-paved surfaces that they were incapable of climbing with their full load.

All the vehicles were called upon to operate with both gasoline and with a 50-50 benzol-alcohol mixture. Only

modifications were made in the carburetor for this latter fuel. There was a falling off in power with the benzol-alcohol mixture and general complaints on the part of the competitors that the alcohol was of poor quality and left solid deposits in the carburetor and the gas passages.

THE Allgemeine Electricitats Gesellschaft manufactures a little device suitable for electrically burning names, marks, etc., on tools and other metal parts, using electric current at very low tension. A small transformer produces a current at 1.5 volts. One terminal is connected to the part to be marked, and the other to a pencil with copper point. Upon writing the name, etc., upon the tool with the pencil the mark is melted out by the electric current. The tool requires no special treatment either before or after marking and the cost of operation of the device is low.

New Automatic Type of Heald Piston Ring Grinder

The rings are fed automatically from a magazine above the magnetic chuck. Rings up to 5 in. diameter can be handled. Is also designed for grinding other parts such as thrust washers, collars, gear hubs, etc. Use of heat-treated alloy steel and roller bearings shows influence of automobile practice.

INCREASED production, together with reduction in cost, is the order of the hour, and machine tool manufacturers are certainly accomplishing remarkable things in the way of devising tools rendering this possible. Heretofore piston ring grinders have been hand-fed machines, the operator putting one ring in, passing the wheel over it and then removing it. The output was not so bad if a ring was finished for every double stroke of the wheel slide, but often the operator's attention is diverted or he relaxes a little and the wheel slide then makes a stroke without any ring in the grinder.

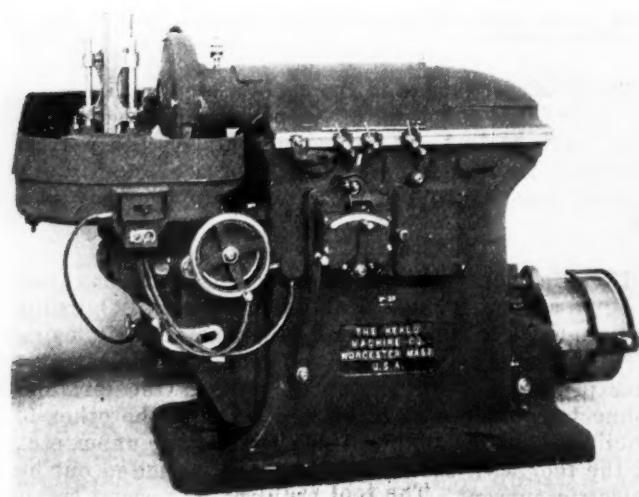
In the new Heald ring grinder, known as Style No. 25, the rings are fed automatically and there is no possibility of a stroke being missed. The rings are stacked in a magazine above the magnetic chuck. Between this magazine and the chuck there is a revolving feeding plate with five holes which are bushed to fit the rings to be ground. Rings up to 5-in. diameter can be handled in this feeding plate. As the plate indexes, a ring is slid from the magazine to the center of the chuck, is ground and then slid off the chuck. The feeding plate is indexed by a lever having a link connection to the crank disk at the back of the machine, operated by a friction device. This crank disk is held stationary by a latch while the wheel slide is moving forward and the ring is being ground; when the wheel slide is on its return motion and passes off the ring, the latch is tripped, and this allows the crank to make one revolution, whereby the feeding plate is indexed from one hole to the next. This indexing motion removes the ring which has just been ground from the chuck and moves another

into its place. There is a guard over the ring which obviates all danger of flying pieces in case a ring should break.

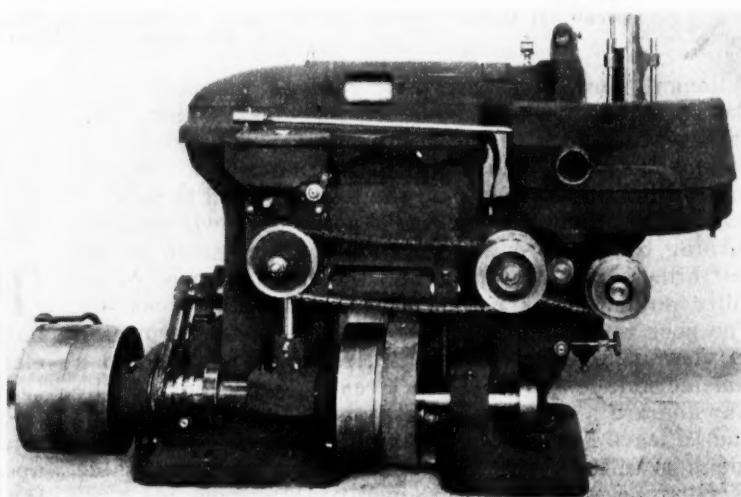
The automatic feed is, however, not the only improvement which has been made to the grinder. The wheel slide is now driven by a hydraulic mechanism using oil as a working fluid. This enables the operator to quickly get any desired speed from nothing to the maximum and also to reverse the feed instantly at any point of the stroke. This reversal is accomplished by means of a tripping lever in front of the machine and two adjustable stops.

The diamond for truing the wheel is located on the chuck pan and can be readily adjusted to give the desired thickness of ring. To bring the wheel over the diamond for truing, the left-hand reversing dog is thrown up, allowing the slide to pass until the reversing lever engages a safety dog. This dog is of the latch type and reverses the slide at both ends of its stroke, allowing it to move back and forth the proper distance for truing the wheel. Movement of the dogs at the front of the machine not only controls the travel of the wheel slide, but also the action of the feeding device.

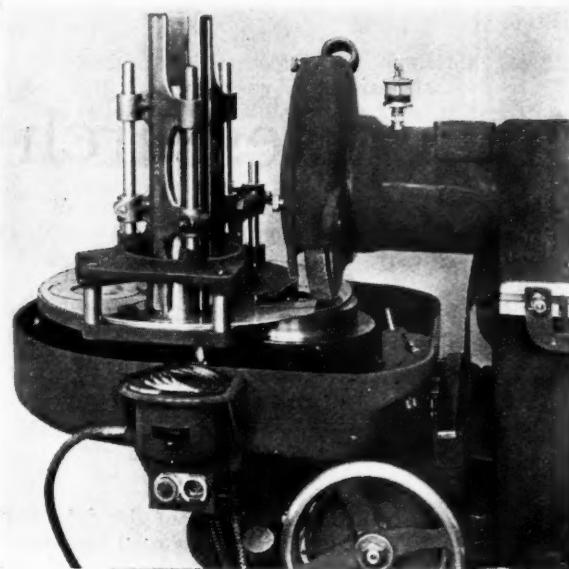
As in the older piston ring grinder, the rings are held on the chuck by magnetic attraction, and in order to be able to readily slide the ground ring off the chuck it is necessary to break the circuit of the chuck coils before the feeding plate begins to move. Not only this, but in order that work having any pronounced magnetic retentivity may be handled with ease the current through the coils must be reversed for an instant and the chuck



Heald Style No. 25 Automatic piston ring grinder



Rear view of Heald piston ring grinder



View showing magazine, feeder plate and truing diamond

and work thus demagnetized. For this purpose there is a disk at the rear of the machine on which there is an electrical contact through which current passes to the coils of the magnetic chuck while the ring is being ground. As the disk revolves, the current is automatically shut off for an instant and reversed, thereby demagnetizing the chuck before the ring begins to move.

By the time the next ring has been slid into place the current is automatically switched on again. With parts of hardened steel this demagnetizing feature is essential, and it is also quite valuable with parts of other ferrous material.

It is interesting to note to what extent automobile practices are made use of in the design of this new machine tool. The more heavily stressed parts, such as the wheel spindle, are made of alloy steel, heat-treated, and ball and roller bearings are used wherever possible. The wheel slide has wide, flat and Vee ways, which insure great rigidity. The wheel spindle is made of chrome vanadium steel and is mounted in a straight, plain, adjustable bearing at the wheel end. This bearing can be adjusted through an opening in the top of the wheel slide specially provided for the purpose. The rear end of the wheel spindle is mounted on a ball bearing. Lubrication of the spindle bearings is taken care of by a large oil cup. The main drive shaft on the rear of the machine is mounted on roller bearings and carries a two-step cone pulley, permitting of giving two speeds to the wheel. The main object of this double wheel speed is to permit the operator to maintain the peripheral speed of the wheel fairly constant as the wheel wears. The vertical chuck spindle is mounted on ball bearings and is driven through helical gears. This gearing is fully inclosed and therefore can be run in an oil bath.

This machine is furnished with either 8-in., 12-in. or 16-in. magnetic chucks, and it can also be used for grinding other parts besides piston rings, such as thrust washers, collars, gear hubs, etc.

Segmental Section Hollow Spoke Metal Wheel

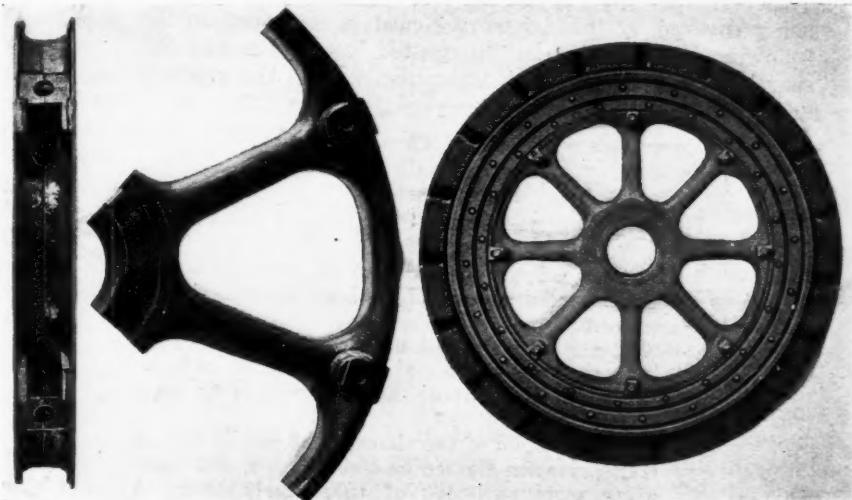
REDUCED weight is one of the greatest needs in truck wheels, and manufacturers of such wheels are making every effort to lighten their product. In the production of cast wheels difficulties are encountered, however, mainly on account of the tendency of the spokes to crack in cooling when cast very thin. To eliminate this trouble and that arising from the danger of inaccurate setting of cores in the casting of hollow-spoked metal wheels, the Van Wheel Corp. has brought out a design of cast metal wheel which is cast in sections. These sections are later united by means of tongued and grooved joints and electric welding. When completed, the wheel is of the same general appearance as a hollow-spoked one-piece cast wheel.

A wall thickness of $\frac{1}{8}$ in. is used in the smaller sizes of segmental section hollow spoked wheels, as compared with $\frac{3}{16}$ in. in most one-piece cast wheels. It is claimed that the percentage of rejected castings is far less in the case of the segmental wheel, the figures given being 15 per cent for the one-piece wheel and 5 per cent for the segmental wheel. With the segmental section wheel the castings are of the shape of irregular triangles, and shrinkage strains are said to be eliminated. It is possible to get a better support for the cores; hence, the wall thickness will be more nearly uniform and the walls can be made thinner. Savings of three kinds are claimed to result from the sectional plan of manufacture—namely, reduction in the amount of metal used, elimination of the labor necessary to remove excess

metal, and a reduction in the percentage of scrapped castings.

In the manufacture of the segmental wheel, after inspection, of the castings, each section is machined, and tongued and grooved at the ends; the sections are then put together and welded electrically along the joints. The complete wheel is held together not only by the electrically welded joints, but also by the hub and the rim, the same as the parts of a wood wheel.

Undoubtedly this wheel is somewhat more expensive to manufacture than a hollow spoked steel wheel made in a single casting, as the machining and welding of the joints represents extra work.



The Van wheel, showing one of the segmental sections

Economics of Highway Research Demand Attention

Advisory Board of Highway Research will lay emphasis on economic side of their work during the coming year. Other highway problems will get attention. The program outlined here is of vital importance to the entire automotive industry. Reports show considerable progress in past year.

CONSIDERABLE progress has been achieved in the co-ordination of highway research and in the encouragement of constructive research activities during the first year's work of the Advisory Board on Highway Research of the National Research Council. The first annual meeting of the Advisory Board, held in New York City Jan. 16, brought together the various agencies co-operating in this work for the purpose of outlining the results of the first year and of considering definitely a future program.

The report of Prof. W. K. Hatt, Director of the Advisory Board, showed how the Advisory Board has developed, the various organizations which are behind it, and told of the activities of the director during the past year in laying out a comprehensive plan for highway research and in attempting to co-ordinate the various research activities along this line which are being carried on in various parts of the country.

The director touched briefly on the work of the research committees and the chairmen of these committees presented full reports.

The outstanding feature of the meeting was the determination to lay particular emphasis on the economic phases of highway research during the coming year. The entire program outlined by Director Hatt is familiar to the automotive industry, having been published fully in *AUTOMOTIVE INDUSTRIES* several months ago. The decision to concentrate considerable attention upon the economic phases of the problem came as a result of the Director's investigations during the past year and of the general sentiment of those attending the meeting.

An excellent survey of the field of activity which is being covered by the Advisory Board is contained in the following brief outline on "Suggested Researches and Research Committees," which was submitted to the meeting and unanimously approved:

1. Committee on Economic Theory.

Problems: To determine all of the elements of cost of highway improvement.

The following will suggest the type of research involved:

- A. Effect of grades, alignment, rise and fall, weather and speed and methods of operation on cost of transport.
- B. Determination of all of the elements entering into the resistance to translation of vehicles (Tractive Resistance) and magnitude of each element.
- C. Determination of the elements of cost of vehicle transportation classed as capital costs, and operating costs exclusive of those included in A and B.
- D. To determine the relation between traffic and capital and maintenance costs of roads.

2. Committee on Structural Design of Roads.

Problem: To establish all of the data required for the rational design of a road surface.

The following will suggest the type of research involved:

- A. Determination of all facts relative to the behavior of the soil upon which roads are constructed, when under load from the road structure.
- B. To determine the relation between traffic loads and stress in road surfaces, and to establish the laws that control.
- C. To determine the effects of the elements on road structures.
- D. To determine the structural strength of all types of road surfaces.
- E. Relation of the vehicle to the road.

3. Committee on Road Materials.

Problem: To determine the most effective combinations of materials to give desired strength and to investigate possible new combinations of materials.

The following will suggest the type of research involved:

- A. To establish the most effective combinations of materials now in use, with particular reference to the exigencies of field control.
- B. To promote research looking to the establishment of new combinations of materials, or of the new materials suitable for road surfacing.

New Committees

4. Committee on *Highway Traffic Analysis*.

Problem: To establish an adequate method of studying highway traffic and to show how traffic records should be interpreted.

The following will suggest the type of research involved:

- A. A study of relation of community development to the origin and destination of traffic, and to devise means for estimating potential traffic.
- B. Proper methods for studying and recording volume of traffic, and for interpreting traffic records.
- C. To devise units of measure to apply to traffic and to define those units.
- D. To study the relation of highway betterment to traffic increases.

5. Committee on *Highway Bridges*.

Problem: To establish all of the data required for the design of highway bridges.

The following will indicate the type of research required:

- A. Determination of loads for which bridges should be designed.
- B. Study impact on highway bridges.
- C. Determination of the proper requirements for standards of design as regards allowable stresses, widths and requirements of foundations.

6. Committee on *Highway Finance*.

Problem: To determine the equitable basis for financing highway improvements.

The following will indicate the type of research involved:

- A. Definition of an equitable basis for highway financing.
- B. Study possible methods of financing improvements in the various political units.
- C. Administrative methods required to insure equitable financing.

7. Committee on Maintenance.

Problem: To determine the relation between traffic and maintenance, costs of roads, to investigate methods of maintenance and organization of maintenance forces.

The following will suggest the type of research involved:

- A. Establishment of accounting methods that will give accurate data on cost of maintenance.
- B. Methods of correlating maintenance costs and volume of traffic.
- C. Relation of maintenance costs to methods of maintenance.

8. Committee on Subgrade.

Problem: To determine the supporting power of soils under all conditions; to investigate methods of increasing the stability of subgrades and to consider any similar problems having to do with the characteristics of subgrades.

The reports of the three committees, which have been functioning during the past year, served to corroborate the soundness of this decision. The three committees to report were as follows:

1. Economic Theory of Highway Improvement, T. R. Agg, Chairman.
2. Character and Use of Road Materials, H. S. Mattimore, Chairman.
3. Structural Design of Roads, A. T. Goldbeck, Chairman.

The committee on Economic Theory was the only one to report very definite progress. A. T. Goldbeck, reporting for the committee on the Structural Design of Roads, stated that "The Committee on the Structural Design of Roads has not been formed up to the present time. . . . Therefore, no report can be presented." He went on to say, however, that the preliminary work which such a committee will finally consider has not been neglected and that the work on structural design of roads is being pushed vigorously through a number of different sources.

Goldbeck cleared up any confusion as regards the function of the board and its various committees, however, by making this statement, which was generally indorsed after some discussion:

"My conception of the work of the various committees is that they shall not perform researches, nor even direct them, but through discussion the various lines of activity will be molded voluntarily in a way such as to lead most directly to the desired end without too much duplication of effort."

H. S. Mattimore, in his report for the Committee on Character and Use of Road Materials, brought out the difficulty of getting satisfactory work from committee members who are able to devote only a limited amount of time to the task and who are busy men in other lines of endeavor. He pointed out the necessity for active co-operation from committee members if results are to be accomplished.

As regards the work of his own committee he stated:

"Although very little has been accomplished through the membership functioning as a committee, there is a considerable amount of work being carried on throughout various organizations interested in highway work along the line proposed by the chairman in the preliminary pro-

gram submitted Aug. 5, 1920. Some contact is maintained with this research work through correspondence, and occasional advice is given to the individual investigator where this is sought."

T. R. Agg, reporting for the Committee on Economic Theory, reported considerable progress during the year. He discussed briefly the experimental work on economical grades which he has been carrying out at Ames, Iowa, and outlined some interesting results which have already been obtained.

Work on the effect of relative air speeds is being carried on by Professor Conrad of Kansas and preliminary results have already been obtained. The S.A.E., through its Research Department, has offered to lay out the items of cost to be included in a survey of elements of cost of highway transportation, so far as the vehicle itself is concerned. Agg's report also touched upon the matter of personnel.

Embodying as it does some very practical steps in advance in highway research, a brief summary of the activities now under way, as reported by Agg, is worth more detailed examination. Following is a brief outline of the report:

"It will be of interest to record the highway investigations of note now under way in the United States. These have not all been sponsored by the Research Council, but are directly or indirectly the result of the persistent effort on the part of the Advisory Board on Highway Research to focus attention upon the vital need of a knowledge of the basic principle of highway engineering.

1. Economical Highway Grades, at the Iowa Engineering Experiment Station—90 per cent completed.
2. Tractive resistance of certain types of vehicles and certain types of surfaces, at Iowa Engineering Experiment Station—under way.
3. Tractive resistance of certain types of vehicles on concrete road surfaces, including a study of methods of observation and of internal power losses in vehicles and tires, at Massachusetts Institute of Technology in co-operation with the Bureau of Public Roads, and at Yale University.
4. Tractive resistance and economical grades at University of Michigan.
5. Effect of relative air speed, at Kansas Agricultural College.
6. The establishing of the relation between traffic and maintenance costs; recently inaugurated by the Bureau of Public Roads.

New researches for which arrangements are complete or are pending:

1. Relation between the roughness and the rigidity of a road surface and rolling resistance, at Iowa Engineering Experiment Station, in co-operation with the Bureau of Public Roads.
2. Elements of cost of highway transport, by Society of Automotive Engineers (pending).
3. Operating costs of motor transport, project pending for studies in connection with motor transport activities in and near Los Angeles.

Statements were made by representatives of each of the member societies of the Advisory Board, each representative appraising the work of the Board from the standpoint of his organization. J. J. Brosseau represented the N. A. C. C., while H. M. Crane and David Beecroft represented the S.A.E. T. H. McDonald, chief of the Bureau of Roads, praised the activities of the board and offered to continue his hearty co-operation.

Officers for the coming year were elected as follows: Chairman, Dean Anson Marsden; vice-chairman, A. L. Flinn; board of directors, H. M. Crane, C. E. Adams, T. H. McDonald.



Transmission Gear Losses and Tooth Wear

Editor, AUTOMOTIVE INDUSTRIES:

I have read with considerable interest E. R. Ross's paper on the investigation of tooth wear, as reprinted in the Nov. 3 number of your paper.

Mr. Ross's investigations show that the subject of automobile transmissions is at last beginning to receive the attention it deserves. It is to be hoped that additional data regarding the effect of gear material and its heat treatment upon the tooth wear will be published shortly, but in this connection it would be desirable that the investigations be carried on also with different lubricants so as to determine their effect upon tooth wear.

In the investigations which I have been carrying on for the last two years in the laboratory of the Joseph Dixon Crucible Co. on the subject of transmission lubricants, the questions of gear wear and transmission efficiencies have received considerable attention, although the latter has been studied at considerably greater length than the former.

The investigation showed quite clearly that lubrication of automobile transmission can be materially improved by the selection of proper lubricants. My investigations have shown that lubricated with the transmission oils generally used, transmissions are very efficient at summer driving temperatures only. This favorable condition, however, was not shown in tests duplicating winter driving conditions. The transmission efficiencies dropped materially, indicating a considerable lubricant at low temperatures, out by gear shifting difficulties in employment of a semi-fluid grease of high melting point made it possible efficiencies practically constant regardless of the outside temperature.

The efficiencies obtained by Mr. Ross to be extraordinarily high, and in my accounted for by the fact that the transmission was tested at an overload which was necessary to have a measurable amount of wear in a test of reasonable duration.

In the course of another test conducted similarly high efficiencies were observed originally, but a check of the dynamometer equipment disclosed certain slight errors in the scale equipment and improved balanced field frames of the dynamometers which accounted for this. A correction of the above errors resulted in obtaining the correct and lower figures for power losses and efficiencies.

Mr. Ross's observations regarding the rise of oil temperature being proportional to the amount of wear are very interesting, but do not seem to be borne out by the writer's experiments. These experiments disclosed that temperature rise, and consequently power loss, seem to be chiefly due to the churning of the lubricant. This was very effectively shown in tests run for a short period of time with the lubricant drained from the transmission. The power loss in these tests dropped very materially, indicating that the power loss due to tooth friction rep-

resents only a small proportion of the total power losses.

The results of the writer's experiments will be ready for publication in the near future, and it is hoped that other investigators will come forward with their own experience covering the subject of transmission efficiencies and gear wear.

G. A. UNGAR.

Cheaper Bodies Coming

Editor, AUTOMOTIVE INDUSTRIES:

It has been something of a task to get one's mind from the best coach and chassis work down to a low priced car or body. It is my understanding, from reading the article on "Growing Demand for Low Priced Closed Car," that the reduction in price, and therefore quality, would be taken wholly from the body.

There are two principal units that go to make up a complete automobile, the chassis and the body. The chassis is not of much use without a body of some description, if it only be a soap box construction. So we can say, from a practical viewpoint, that the body and chassis are of equal importance. I realize this is a statement that would not go unchallenged a short time ago, but to-day the body is coming into its own and along with it the body engineer. The Society of Automotive Engineers held its first meeting devoted entirely to body engineering only last year. From now on I believe we will see some remarkable strides in body construction and design.

Does the so-called motor public demand a low priced car? I believe they do, but not a \$1,000 chassis with a 50 cent body, or a \$2,000 chassis with a \$1 body; not just at present. The motor public believe they know all about bodies. You can talk to anyone about transmissions, engines, clutches, frames, rear axles or any part that goes to make up a complete chassis; tell them anything in fact and at least get away with part of it. Try it with the body. The whole motor public, from the office boy to the president, knows all about how the body should be designed, constructed, painted and named.

Would the enclosed body buyer of to-day be satisfied with an all metal, black enameled body, say on a Packard chassis? A body with straight, severe lines, no turn-under or side sweep to give it a pleasing appearance, a flat roof, no mouldings, cushions of the old style spring construction covered with cane-work, no trimming above the belt or in the place of cane-work a cheap, cotton fabric trimming material, trimming tacked on frames and stuck in place, such a body would have little appeal to the car buyer. He would be outraged at all the squeaks and rattles that go with such a construction, the common window glass with all its ocean wave effect in place of the selected mirror quality that is demanded by the public today, the tin-like sound when the doors are closed and the rse-like color.

he my opinion, it is more or less a matter of keeping up In the Joneses, not only with the public, but with the manufacturers themselves.

manufac. I think the public must have a radical change of

No, I think we reduce body prices materially, for they heart before expensive at present with all the accessories demand the e,

January 26, 1922

AUTOMOTIVE INDUSTRIES
THE AUTOMOBILE

189

thrown in. I believe, however, that in time we will have a good, low priced closed body, although we must stop considering the body as a plaything and simply an appendix to the chassis. It must be given just as much consideration as the chassis.

I believe the inexpensive body in the future will probably be developed in two ways. First, by a body made entirely of stampings riveted together, in place of the expensive welding operations now employed, and enameled. The other, and probably more logical solution, would be the discarding of metal panels entirely and the expensive die cast connected with such work, and building the body of some material other than metal. This has been tried out to some extent, but has not proved a success as yet. However, that does not mean that it is a failure.

The more one thinks of the idea of an inexpensive body on a good, substantial chassis and the corresponding reduction in purchase price has certainly an appealing side, and it can and will be done before long even to the elimination of painting operations.

A. L. KNAPP, Assistant Body Engineer,
Packard Motor Car Company.

Steering Track-Laying Vehicles

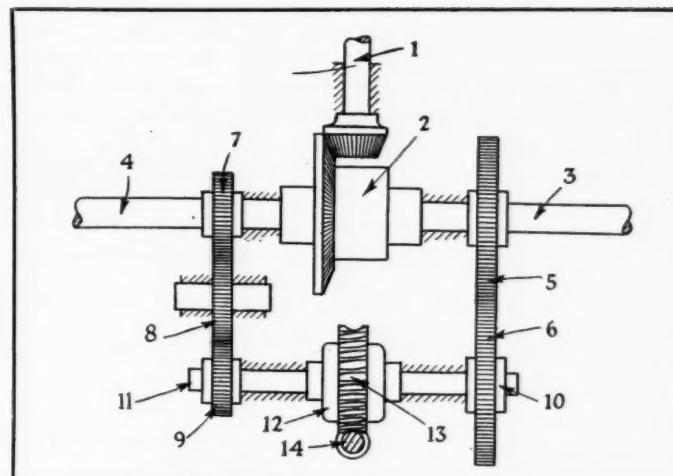
Editor, AUTOMOTIVE INDUSTRIES:

Steering mechanisms for track laying vehicles and the like are still of crude construction; their clutches and brakes involve wear and loss of power, as well as difficult steering. Therefore the construction, suggested in the design herewith, may be of interest.

The engine is connected through shaft 1 and an ordinary differential 2 with both driving shafts 3 and 4. These shafts carry the gears 5 and 7; gear 5 meshes with gear 6 and gear 7 with gear 9 through the idler 8. The gear ratio between 5 and 6 is the same as between 7 and 9.

Gears 6 and 9 are fixed on shafts 10 and 11, which are connected through an ordinary differential 12; the housing of 12 carries the worm wheel 13 meshing with worm 14. Worm wheel and worm are non-reversible. The spindle of worm 14 carries the hand-steering wheel.

As long as the vehicle travels on a straight track



Suggested type of steering device for track-laying vehicles

there is no difference in speed between shafts 3 and 4; hence shafts 10 and 11 revolve with equal speed, but in opposite directions to each other. It is obvious that the housing of differential 12 therefore remains stationary, as well as the worm-wheel and worm. These being non-reversible the differential 2 is automatically locked, hence zig-zagging of the vehicle is impossible.

As soon as the hand-steering wheel is turned, however, shafts 3 and 4 receive a supplementary motion in opposite directions to each other, causing the vehicle to turn. The direction of turning depends upon the direction in which the hand-steering wheel is revolved; the vehicle keeps turning as long as the hand-steering wheel is kept turning and immediately resumes a straight track as soon as the hand-steering wheel is kept stationary, independent of the position of the latter.

It is obvious that many similar solutions are possible as long as between shafts 3 and 4 there is a stationary gear or part, such as 13, the turning of which changes the position of shafts 3 and 4 with regard to each other.

I think that the principle of this construction completely solves the problem of directional control of track-laying vehicles and the like.

H. C. OLIVIER.

Making Clutch Operation Easier

J. G. KOPPEL has developed a number of new devices intended to make the operation of passenger cars easier, suiting them particularly for lady drivers. He claims that many drivers, men as well as women, let in the clutch too quickly and thereby subject their cars to unnecessary strains. To obviate this he proposes to fit the clutch with an hydraulic dashpot. This consists of a cylinder and piston connected to the clutch pedal. When the clutch is opened the piston rises in the cylinder and encounters very little resistance, because the oil can flow freely through a large automatic poppet valve. On the other hand, when the clutch is being let in the oil has to pass through an adjustable needle valve, whereby its flow is retarded, so the time of engagement can be adjusted as desired.

In order to facilitate gear shifting Mr. Koppel has devised an hydraulically operated gearshift with electromagnetic selection. The actual pressure for shifting the gears is derived from oil under pressure being admitted to cylinders in which there are pistons that are connected to the shifting bars. The valves admitting the oil to the cylinders are operated by solenoids controlled both by a selective switch and by a main switch,

which is connected to the clutch pedal, closing as the pedal is depressed. A special feature of this system is that the oil in the shifting cylinders and pipes is under pressure only while the shifting takes place and that the electric current flows only during these periods.

Mr. Koppel has obtained patents and applied for others on this system and now is laying plans to build a sample car of the "Ladies Special."

THE Governing Board of the French Committee for Aeronautical Propaganda has decided to establish a prize of 1,000,000 francs which will be awarded to the manufacturer of a commercial aircraft engine which has demonstrated, in meeting the conditions of a test organized to this end, qualities of longevity, dependability, easy demountability and maintenance. The engines must be ready for the tests on June 1, 1923, at the latest. The competition will be international, with the reservations of the present regulations of the Aeronautical Federation. Nevertheless, non-French manufacturers must engage themselves to arrange for the manufacture of their engine in France.

Distributors or Factory Branches?

Part II

Present deficiencies in the car distribution system may not be inherent in the system itself, but simply the result of rapid growth. The fundamental functions of the distributing agency is the prime consideration in determining whether or not distributors or factory branches are most efficient. The danger of overcentralization should be recognized.

By Harry Tipper

IT is necessary to emphasize the rapid growth of the automobile business in order to indicate properly the reason for the present condition in the distribution system. In all new and rapidly growing businesses there is a great flux and change among individual concerns, whether in the manufacturing or the distribution end. This is particularly true of all the elements involved in the distribution and sale of automotive products. Although there are to-day 66,000 dealers in the field who have some influence upon the distribution of products, only a very small number of these have been in that business more than ten years, and a majority of them much less than that length of time.

With this rapid influx of new concerns into the retail and wholesale distribution of automotive products there has not been any time or opportunity to bring this distribution system into any settled policies or settled methods of doing business. This is true of the car dealer as it is true of those handling other products in connection with the field.

The sale of an automobile does not end with the delivery of the product itself—it includes a great deal of work to be done after the product has been delivered and it requires a continuity of contact, a competence and a consideration of service very different from the line of contact required in the case of the man selling household machinery or other hardware.

The contact between the user of the automobile and the retail establishment selling the cars has not been established very long in most cases, because a majority of the concerns now doing business entered this field less than seven years ago and a large number of those less than five years ago. While a good many of these may have been connected with the automotive business in some way or another before, they were not intimately associated by long experience with the detail problems involved and they have not been able, up to the present time, to settle down into a regular policy of operating their business which would permit the manufacturer to depend upon certain efficiencies and to recognize certain difficulties to be generally considered.

While it is true that these retail establishments are all concerned with the sale of cars, they are not yet welded

together in a common occupational body with common traditions and methods of operation. Under the conditions it would be impossible to expect this, and the manufacturer's calculations must be affected by that consideration.

The functional values of the wholesale establishments dealing in cars and the retail establishments similarly dealing in the sale and the maintenance of cars are not altered by the inefficiencies and difficulties involved in the present state of the distribution system. If there are certain fundamental values to be secured through the distribution of cars from factory to wholesale distributor—to retail dealer—these fundamental values are not altered because the present concerns do not exhibit a fair standard of efficiency all through the distribution system in this respect.

The manufacturer of automobiles, therefore, must consider this distribution problem from two points of view: First, the recognition of the weaknesses of the present state of affairs in connection with the distribution of cars; the rapid growth in the num-

ber and the great variation in the character of these establishments, and the impossibility of securing any fair agreement in efficiency under such conditions of growth. Second, the fundamental values to be secured out of the particular elements in the distribution system and how these values are to be obtained in working from the present condition.

The individual manufacturer cannot afford to ignore the great variation in efficiency, the lack of co-ordinated policy, the difficulties with service and the other conditions facing him in his attempt to market his product under present conditions. At the same time it is necessary for him to be wary in considering any radical changes in the system of distribution because the present inefficiencies and difficulties are not necessarily inherent in the system. They may be only due to the rapidity of its growth and the lack of long experience in the individual concerns comprising it.

Considering the question of what use is the distributor to the car manufacturer—the advantages of the distributor are these:

1. The distributor permits a better and more orderly credit condition and a larger and more regular control of production fluctuations so that a better manufacturing condition may be maintained. Due to his ability to obligate himself for a larger number of cars and due to the fact that his credit conditions may be more easily determined, the extent and character of the obligation permits a more definite consideration of the manufacturer's position in the necessary speculation upon future operations.

2. The distributor is in a position to supervise intensively and to develop the sales and service conditions and methods of the individual retailers in the several localities in his territory.

It will be contended by the manufacturer of automobiles that the distributor does not actually perform these functions properly in most of the cases. The contention has some merit, but it arises principally out of the newness of the business and the conditions of its growth in the absorption of the product into a virgin market. If these functions can be performed more economically by a factory branch than an independent establishment, there is some ground for considering the factory branch as a proper element in the distribution scheme. If the most efficient of the distributors are able, under the best practice of to-day, to perform these functions satisfactorily, their success is a demonstration of the feasibility of the system to fulfill the economic necessities and consideration should be given accordingly. The method of using independent distributors has the advantage of being more flexible. It does not commit the manufacturer to a certain policy involving actual location, area and development in each particular city in which the central distribution point is considered.

The disadvantages of the distributor are:

1. The intervention of the distributor under the present conditions makes it a little more difficult to control the conditions of sale and the market for the product.

2. The intense application of the market which is necessary under the present conditions of marketing may not be secured through the distributor's system except in certain individual cases.

These disadvantages, however, are not inherent in the system of going through the distributor, but are concerned largely with the present conditions in the field and the great variation in the character of distributors' organizations due to the rapid growth and the economic conditions surrounding that growth. They are very practical difficulties and they must be overcome, but they do not make it necessary for the distributors to be eliminated from the system, except as the individual circumstances of the individual manufacturer operate to demand a change in his particular case.

In this consideration of the distributor no comparison has been made from a general economic standpoint between the distribution of cars through the wholesale organization and the distribution of cars directly from the factory to the retailer. The comparative advantage of either method depends somewhat upon the particular circumstances of the individual manufacturer. If the

manufacturer is making a small number of cars and has a limited production in his factory, depending upon getting his market because of the intense individuality of his sales work and the character of his product, it is feasible to be in touch with a few well-selected dealers and to keep a close factory contact with those dealers. Where the production is large and the cars must be distributed through a great many local points in order to secure the market, maintain their place and deliver adequate service, the organization required to deal direct with the retailers under these circumstances may become unwieldy and require the establishment of numerous branches that are in reality nothing but wholesale establishments controlled by the factory. Where car production is large, practically all such production goes through establishments of a wholesale character. Whether they are controlled by the factory as branches of the factory or independent organizations concerned only with the sale of the cars does not alter the function.

It should be noted at once that the control of the market apparently resulting from direct contact between the manufacturer's organization and the retailer does not necessarily mean an increased efficiency in the market. Marketing is a business of ideas, initiative and judgment. Systems and methods, standardized values and appeals and similar mechanical circumstances of marketing are subordinate to the psychological values of initiative, judgment and adaptability in those conducting the marketing work. The great competition in marketing is a competition of ideas, and one of the greatest difficulties in this marketing competition is the tendency to a similarity of market ideas and methods which robs the product of its individuality and decreases the efficiency of the whole marketing effort.

This part of the efficiency of marketing has been neglected to a very large degree, not only in this business, but in many other lines. It has not received the proper attention and it has a tremendous bearing upon the methods of distribution, which will maintain and improve the market under the more difficult economic conditions confronting us. The control of the manufacturer, exercised through factory branches to the dealer, may result in centralizing the decision and judgment, so that the efficiency of the individual work is lessened and the pace of improvement considerably decreased. The present difficulties with which the manufacturer is faced are naturally the result of the rapid growth, a great influx of dealers into the business, a wide variation in the standards of business operation and in the understanding of the necessities involved in the marketing.

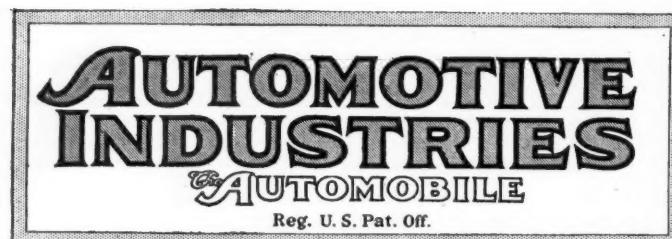
These things cannot be wisely changed by means of any patent medicine methods which cannot be applied equally to all cases. Such methods are likely to add confusion to the present difficulties instead of clarifying the situation. Some of the main elements involved in these difficulties are contracts, quota deliveries, requirements of service, credits and the handling of used cars.

Discussions of these subjects will follow a general consideration of the car dealer and his economic place, which will form the subject of the next article.

Material Handling Machinery and Methods

A MATERIAL Handling Encyclopedia has been published by the Simmons Boardman Publishing Company that embraces under one cover available information on material handling machinery and methods. The editors have made the book interesting and valuable alike for the executive or for the operating man. Detailed descriptions of methods of operation and illustrations

of practically every known device used in the handling of material are contained in the volume. Separate sections are divided off in the book, each one containing the information concerning different types of machinery, such as hoisting machinery, elevators, etc. Another feature is the definition section which serves as a dictionary of material handling terms.



PUBLISHED WEEKLY

Copyright 1922 by The Class Journal Co.

Vol. XLVI

Thursday, January 26, 1922

No. 4

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To Subscribers—Do not send money by ordinary mail. Remit by Draft, Post-Office or Express Money Order or Register your letter.

Owned by United Publishers Corporation, Address 239 West 39th St., New York; H. M. Swetland, President; Charles G. Phillips, Vice-President; A. C. Pearson, Treasurer; Fritz J. Frank, Secretary.

Entered as second-class matter Jan. 2, 1903, at the post-office at New York, New York, under the Act of March 3, 1879.

Member of Associated Business Papers, Inc.

Member of the Audit Bureau of Circulations.

Automotive Industries—The Automobile is a consolidation of The Automobile (monthly) and the Motor Review (weekly), May, 1902, Dealer and Repairman (monthly), October, 1903, and the Automobile Magazine (monthly) July, 1907.

Developing Leaders

PRESENT production conditions offer an exceptionally good opportunity for the development of capable supervisors in the production ranks. With the plant operating at only part of its capacity, the possibilities are increased for allowing a promising worker to shift from one related job to another, thus giving him a chance to visualize a larger part of the production scheme.

The lack of the feverish haste sometimes necessary during peak production times gives a better opportunity for executives to study the work of their subordinates and to give more attention to the development of those qualities of leadership which the subordinate may possess. Thus prospective foremen and sub-foremen may be developed in the shop and capable junior executives made ready in the office.

The management which takes advantage of this comparatively dull period to discover and properly develop prospective leaders will have a firm foundation upon which to rebuild its working force as production increases. The present time offers particu-

larly good opportunities for a study of the human problems of industrial management. The fact that there is no pressure from labor is a strong reason for, rather than against, spending considerable effort at this time in a consideration of the human element.

Air Cleaner for Road Vehicle Engines

THERE seems to be a growing belief among automobile engineers that the use of air filters on motor trucks and even on passenger cars would be a good thing. The idea of filtering the air for use in internal combustion engines used on road vehicles is by no means new, for it was suggested as long ago as 1900 by a French engineer, who developed a centrifugal type of air cleaner. This man was evidently ahead of the times. At that time automobile designers had other and more pressing problems to solve and they gave scant attention to this pioneer. Automobiles of that period, as a rule, were not worn out but were discarded because of obsolescence. Hence there was no particular need for reducing their rate of wear.

Since then the air filter or air cleaner has come to be recognized as a necessity on farm tractor engines. Some of the older manufacturers for a long time relied upon the expedient of fitting the engine with a sort of conning tower through which air was taken into the carburetor from above the dust clouds. However, these conning tower type air inlet pipes do not seem to have met requirements, for they are gradually disappearing.

All air contains a certain amount of dust, though this may not always be directly visible. When a beam of bright sunlight falls into a room through a window, the dust can be plainly seen floating in the air. This dust is no doubt of an extremely fine division, but it is hard to believe that it is too fine to have an abrasive action on the cylinder walls. The relative amount of dust in the air is immeasurably greater when a lot of cars travel in procession over an ordinary dirt highway after a run of dry weather in summer. During extremely dry periods such roads are sometimes covered with a layer of dust, inches in depth, and the amount of dust stirred up by a motor vehicle under these conditions is enormous. With only a slight amount of dust on the road a fast moving car probably does not draw into the engine much of the dust stirred up by itself, as the dust cloud rises only after the vehicle has passed, but if the road is covered with dust an inch or more in depth the whole car will be enveloped in a dust cloud.

Attempts are now being made abroad to introduce air cleaners for use with stationary air compressors, so as to eliminate the wear on the cylinders and pistons resulting from the dust carried by the air. These compressors in the great majority of instances operate in localities comparatively free from dust, but with the enormous quantities of air passing through a large air compressor in the course of a year a dust content of even a grain per thousand cubic feet will give a very considerable total. There is a natural tendency for the dust to adhere to the walls of the en-

gine cylinder which is moistened by lubricating oil. Chemical analysis of the "carbon" scraped from the walls of the compression space and the piston head have shown that this consists very largely of siliceous material, in other words, road dust. The oil furnishes the binder for this dust and is later carbonized by the heat, making the mixture of oil and dust a solid mass.

There is considerable objection to the use on high-speed engines of air cleaners of a type which offer high resistance to the passage of air, because such a cleaner cuts down the volumetric efficiency and the maximum output of the engine, but it is quite possible to make an efficient cleaner which offers only an inconsequential resistance. With truck engines this objection does not exist, or at least has not the same force, as truck engines are generally run at moderate speeds. Moreover, long life and freedom from need of frequent expensive repairs are particularly desirable in commercial vehicle engines. It is evident that the greatest need of air cleaners exists in connection with farm trucks which most of the time are being driven over dirt roads and fields, and it is quite likely that the air cleaner will enter the truck field through adoption on farm trucks. Some of the manufacturers of these trucks also make farm tractors and through experience in that line have learned to appreciate the advantages of the device.

Front Wheel Brakes

THREE is no immediate possibility that front-wheel brakes will be adopted by makers of low and medium-priced automobiles in this country. On the other hand there is a very marked interest in the subject on the part of those engaged in the making of the higher-priced heavier cars. Experimental jobs so equipped are on the road in several parts of the country and makers in this class who are just about to enter production have announced their intention to use them.

There is some possibility that the use of this type of brake on the higher priced cars will almost make it imperative on the part of makers in the medium priced field to do something, at least, either along the same line, or on some other line which will provide more efficient braking.

Rear-end collisions in crowded city traffic because of the ability of the car ahead to stop more quickly than the car behind are increasingly frequent. Provide more of the cars in the traffic stream with brakes capable of cutting the distance required to stop in half, and the number of such collisions will also increase. Most rear stop signal flashes begin to act only after retardation has commenced, and the hand is not always thrust out in time to signify the intention of the driver to come to a stop.

A few years of development on the four-wheel brake may well lead to some simplified installation that will be low in cost and yet highly effective. Good brakes have more influence on speeding traffic than good acceleration and since the question of emptying the business section of the cities by bus and passenger car is becoming more and more acute, good brakes will play their part in helping solve this great prob-

lem. The front wheel brake should be studied closely during the next two or three years. We are apt to see more of them.

Aids to Better Service

MANY manufacturers are to-day paying more attention to the matter of giving, through their branches and agencies, better and less expensive service than has heretofore been common. The whole industry is more inclined than ever to seek a solution of the service problem, realizing that the attention which it is given is one of the most important elements establishing the good-will without which every enterprise is, sooner or later, bound to fail.

Aside from the expense involved in repair work, and sometimes even more serious from the owner's viewpoint, is the inconvenience of being without the use of the car, the necessity of which is seldom so keenly realized as when the car is laid up for repairs. It is, therefore, desirable to minimize in every possible way the time required for repairs. The element of accessibility plays an important part in this regard.

It is important, of course, to lay down a design in such a way as to facilitate production, but this should not and need not interfere with having the assembled car or unit accessible, though it has all too frequently been allowed to do so. Too often the production engineer, whose advice is frequently a controlling factor in the design of the ultimate product, is so much interested in making parts so as to be easily machined and easily assembled, that he is apt to lose sight of the need for making them so they will also come apart readily when in place in the completed vehicle. The advice of competent service men should always be considered before a design is finally approved.

Parts which are apt to require attention can often be so made that they can be quickly disconnected, say by the removal of one or two bolts, and replaced as quickly by an identical unit which is new or has already been repaired. The unit removed can then be put in condition for use on the next car, which requires a similar job done upon it. Much time can be saved in this way, and the replacement can often be made by less skilled workmen than are required in the actual repair work. Thus the best workmen are kept at the bench where, if the quantity of repair work is sufficient, they can specialize in a certain line and become very expert and rapid at it. This method of operation is now used chiefly on electrical units and more or less similar parts once regarded as "accessories," but might well be extended to other parts, with great savings both in time and expense, though it has, of course, certain limitations. It can, for example, be used in the case of brake bands and brake shoes which require relining. A few sets of relined parts can be kept on hand, and when a car comes in to have its brakes relined, instead of waiting for the lining to be drilled and riveted in place, a set of ready relined parts is quickly inserted. The parts replaced are then relined for use on another car.

There is nothing very new about all this but the possibility of extending a system of this character to other parts of the car is worthy of consideration.

See More Activity After Chicago Show

Price Atmosphere Expected to Be Cleared Then—Uncertainty, Retarding Sales Factor

By James Dalton

NEW YORK, Jan. 24—Uncertainty of the public on the question of prices continues to some extent to hold up retail sales of automobiles. In New York the week following the show closed with a fair volume of business on the average. Some dealers had a remarkably good week, indicating that there had been an easing up of speculation regarding further price reductions, but others experienced a continuation of the holding back which became evident the latter part of show week, when news of approximately 50 price changes became generally known.

More Cuts Certain

Indications now are that the apparent sizable volume of deferred business uncovered by the shows in New York, Philadelphia, Buffalo and several other large cities, will not become active until after the Chicago show, which opens Jan. 28. It is practically certain that some further price changes will be made by companies which did not reduce in connection with the New York show. These changes probably will be announced at the Chicago show and at the same time it will become known whether any manufacturers already in line with reductions contemplate "second cuts," which the industry does not consider likely, in view of the present pre-war, or near pre-war level of the majority of prices.

Lincoln Plan Causes Concern

One factor which is causing considerable concern to manufacturers in the higher price classes is the announced decision of Henry Ford to take over the Lincoln plant if he can get it at what he considers a fair price. There now seems little doubt that he will be successful. While it is not expected that anything revolutionary will be attempted by Ford in the immediate future, there is little probability that he will be long content with limited production. The Lincoln plant has a potential capacity of 20,000 cars a year. At present prices there is no market for any such number of Lincoln cars. But if the introduction of Ford production methods, the Ford system of buying supplies and a sharp curtailment of costs will permit the sale at \$2,500 of a Lincoln car in

which little of the quality has been sacrificed, the market for the product will be greatly enlarged.

So far as his own car is concerned, Ford has done the industry generally a good turn by his recent price reduction of \$7 on the touring car and \$15 on the enclosed models. It will do much to convince the public that motor car values are about down to rock bottom. There are few companies in the lower price classes which can afford to make further material cuts.

The biggest job at present is to convince prospective purchasers that they can save little money by deferring purchases. By far the largest proportion of the "live" prospects now are owners of automobiles and they expect to trade-in their old cars. In their case every price cut automatically reduces used car values, so they will make practically nothing on any reductions which may come.

The record attendance at the New York show demonstrated that public interest in motor cars is keener than ever. Bankers have been particularly pleased at the manifestation and it has had something to do with the recent rise in motor stocks. Manufacturers were deeply gratified and all of them are making preparations to meet the spring demand which they consider inevitable. As a consequence business of parts and accessory makers is running on practically the same basis as for the last three months.

No New Financing Plan Proposed for Overland

NEW YORK, Jan. 24—Reports that some new plan had been worked out for refinancing the Willys-Overland Co. are erroneous. The negotiations with preferred stockholders to gain their assent to a plan which will permit liquidation of the company's bank loans are progressing as rapidly as can be expected. It is probable that the refinancing will take the form of a bond issue for approximately \$15,000,000.

The company has paid 20 per cent of its bank loans and they now stand at about \$16,000,000. It is probable that another 10 per cent will be retired in the near future and if this is done \$15,000,000 will be adequate to take care of the remainder of the bank indebtedness. The earnings of the company now are ample to provide working capital.

DELAWARE TO TAX GASOLINE

WILMINGTON, DEL., Jan. 23—Although the Delaware Legislature does not meet until next year, a bill to be introduced at the next legislative session is being prepared taxing gasoline two cents a gallon. The proceeds from the tax would be applied to the construction of new roads.

34 Cities Chosen for Parts Depots

More to Be Added—Sub Dealers Will Be Appointed For Smaller Communities

DETROIT, Jan. 23—Central parts distribution depots of the new unit parts group have been located in 34 leading cities of the country and with the addition of some half dozen more, the main distributing organization will be complete. The companies and cities thus far selected are:

Atlanta, Motor Parts Corp.; Baltimore, Quaker City Motor Parts Co.; Boston, Campbell Motors Corp.; Buffalo, Units Parts Corp.; Charleston, S. C., Carolina Motor Parts Co.; Chicago, Standard Unit Parts Corp.; Cleveland, Automotive Parts Co.; Columbus, Automotive Parts Co.; Cincinnati, Automotive Parts Co.

Dallas, Motor Parts Depot; Denver, Gall Auto Specialty Co.; Des Moines, Standard Motor Parts Co.; Detroit, Automotive Parts Co.; Harrisburg, Pa., Quaker City Motor Parts Co.; Indianapolis, Central Motor Parts Co.; Kansas City, General Auto Parts Co.; Louisville, Edigen Motor Parts Co.; Los Angeles, Colyear Motor Sales Co.; Memphis, company's title not chosen.

Milwaukee, Standard Unit Parts Corp.; Minneapolis, Baldwin Service Co.; New York, Chadick Delamater Corp.; New Orleans, Standard Motor Parts, Inc.; Omaha, Omaha Motor Parts Co.; Philadelphia, Quaker City Motor Parts Co.; Pittsburgh, Superior Motor Parts Co.; Portland, Ore., Colyear Motor Sales Co.; Richmond, Standard Parts Co.

Salt Lake City, Mendenhall Auto Parts Co.; San Francisco, Colyear Motor Sales Co.; Seattle, Colyear Motor Sales Co.; St. Louis, Authorized Motor Parts Co.; Spokane, Colyear Motor Sales Co.; Toledo, Automotive Parts Co.

The companies whose products will be distributed through the parts depots are Continental Motors Corp., Timken-Detroit Axle Co., Brown-Lipe Gear Co., Borg & Beck Co. and Spicer Mfg. Co.

Must Carry Adequate Stocks

Each of the unit parts depots will be financed by local capital entirely and will be operated according to conditions existing in the different cities. Contracts have been signed for handling the distribution of the unit makers' products, and in turn they will sign sub-dealers who will handle the unit parts in the smaller cities of the 40 districts.

These contracts in the main only require that the station maintain an adequate supply of parts at all times, the supply to be based on the population served and the total registry of cars in the districts. Prices are set by the factories, freight variations causing any difference that may exist in prices in any section.

The business of signing distribution agencies in the smaller cities will be carried through during the early months of the year and by April, factory parts will be available in any section of the country in five to six hours.

To Change Lincoln Price, Leland Says

Will Follow Sale—Changes Will Be Instituted in Factory Methods

DETROIT, Jan. 24—Purchase of the Lincoln Motor Co. at the receiver's sale Feb. 4 by interests friendly to the Leland control will mean carrying through for the first time the complete Leland policy, according to a statement made to-day to AUTOMOTIVE INDUSTRIES by W. C. Leland, vice-president and general manager of the company. Under the old régime, he said, clashing elements in the directorate made it impossible to put these policies into effect.

There will be many changes in the conduct of the company's affairs, Leland said, but they will be mainly in the merchandising and not in the production end of the business. The former standards of manufacture for the Lincoln car will be adhered to closely with the steady improvement of the product always in mind. Better markets will be opened under the reorganization, he added, and buyers of Lincoln cars will be given the full benefit.

No Change in Organization

There will be a revision of prices after the sale, Leland declared. Since the factory has been in the hands of a receiver a careful study has been made of the possibilities of the plant and several changes in manufacturing methods will be instituted. The equipment has been brought to the highest point of efficiency and everything is ready for immediate resumption of production. It is expected that from 6000 to 8000 cars will be made in 1922.

The Lincoln sales organization will be continued as it stands. The new prices and the improved quality of the product are counted upon to bring sales to a point where the factory may be operated up to capacity. The Lelands hope to make and sell 12,000 cars in a good business year. The factory organization will be strengthened but no radical changes are contemplated.

Many parts which formerly have been purchased by the company will be made in the Lincoln factory hereafter. This will include eventually the manufacture of its own bodies, but for the present the company will continue to buy bodies.

Gardner Statement Shows Clean Financial Slate

ST. LOUIS, Jan. 24—The Gardner Motor Co., in its statement as of Dec. 31, has wiped its financial slate clean. It has taken a loss of \$800,000 for the year but presents a balance of \$600,000 in cash and not a dollar of indebtedness. The loss on inventory for 1921 was \$990,000.

Organization and prepaid expenses, tools, dies and patterns all have been

wiped out as balance sheet items. Buildings and equipment have been reduced from \$600,000 to \$400,000 and inventories from \$1,700,000 to \$500,000 representing cost or market. These items with the \$600,000 in cash and \$50,000 accounts receivable bring the total assets to \$1,550,000.

The company expects to develop the South and Southwest as its principal sales field. It is confident the South has turned the corner and with the markets developed on the Atlantic and Pacific coasts the company hopes for much larger sales in 1922.

80 Per Cent of Merchandise Creditors Accept Earl Plan

CHICAGO, Jan. 23—The proposed reorganization plan for Earl Motors, Inc., has been accepted by nearly 80 per cent of the merchandise creditors who have claims aggregating \$3,000,000. Preferred and common stockholders have been asked to deposit their holdings, as voting trusts will be formed under the direction of the bankers' committee.

Preferred stockholders will be asked to waive their right to dividends. No changes will be made in the present stock outstanding, but it will take rank after the deferred income debentures and 7 per cent prior preference stock which will be issued. The creditors will receive two-thirds of their claims in the new debentures and one-third in prior preferred.

Reynolds Spring Shows \$572,658 Current Assets

JACKSON, MICH., Jan. 24—The Reynolds Spring Co. in its general balance sheet as of Dec. 31 shows current assets of \$572,658 and current liabilities of only \$1,705. Cash amounts to \$392,190; accounts receivable to \$37,675 and inventories to \$142,791.

The inventories are priced at cost or market, whichever is lower. The total assets are \$1,912,571 and the surplus is \$162,539. The company anticipates occupying next month a new two story fire-proof addition to its factory. This is expected to make a considerable saving in expense of operation. The company is carrying life insurance amounting to \$140,000 on some of its officers and employees, payable to the company in case of their death.

DORRIS ELECTS OFFICERS

ST. LOUIS, Jan. 23—at the annual stockholders' meeting of the Dorris Motor Car Co., held at the company's offices, George P. Dorris was re-elected president and chief engineer; Webster Colburn, vice-president and general manager, and J. F. Culver, secretary and treasurer. Frank C. Thompson was elected second vice-president. Re-elections to the board of directors include Dorris, Colburn, Thompson, H. B. Krenning, George C. Griffith, Parker H. Woods and Judge Jesse McDonald.

Rail Commissioner Is Urged in Report

United States Chamber Committee Recommends Congress Authorize Appointment

WASHINGTON, Jan. 24—The committee on railroads of the Chamber of Commerce of the United States has prepared a report recommending that Congress be urged to enact legislation authorizing the President to appoint a special administrative officer with the title of Commissioner General of Transportation, who would hold office subject to the will of the President, who would prescribe his compensation. The report will be considered at a meeting of the national council to be held in Washington, Feb. 8 and 9.

The report says the commissioner should be selected because of his familiarity with transportation problems and that he should make to governmental agents in charge of the regulation of interstate transportation such recommendations as would be for the public interest and tend to co-ordinate the administration of laws respecting "interstate transportation by land, water and air for the promotion and development of a national system of rail, water, highway and aerial transportation and will make possible the articulation and economical use of all transportation facilities, including tracks, highways, terminals, transfer facilities, docks and landing places."

Wide Scope of Powers

The report proposes that the commissioner should reconcile so far as possible conflicting rulings of boards, commissions and bureaus and where they cannot be reconciled in a way to promote the general development of a co-ordinated system of interstate transportation make recommendations designed to correct inharmonious provisions.

Another section of the report states that the commissioner should be entitled to be heard at any hearing given by a governmental agency and to produce evidence that would tend toward the promotion and facilitation of the continued development of an interstate transportation system that would be adequate to meet the transportation needs of the country. The committee believes the commission should be authorized to grant Federal charters to corporations proposing to engage in interstate transportation by land, water or air.

WICHITA PLANS CHANGED

WICHITA FALLS, TEX., Jan. 23—Wichita Motors Co. has canceled its plan of consolidation with the Price-Campbell Cotton Picker Corp. and announces that it will continue the manufacture of Wichita trucks under the name of the Wichita Motors Co. No reorganization of the company is now under contemplation.

Bosch Head Makes Denial of Rumors

Says Martin E. Kern Sailed for Europe with Full Knowledge of Government

SPRINGFIELD, MASS., Jan. 24—Arthur P. Murray, president of the American Bosch Magneto Corp., asserted to-day that there was no basis for a sensational report that the departure for Europe of Martin E. Kern was the result of the investigation by the Department of Justice into the sale of the Bosch plant to the present owners by the Alien Property Custodian in 1918. Murray declared that Kern sailed with the full knowledge of the Department of Justice and that he was, as a matter of fact, on a mission for the Department of Commerce, carrying letters of introduction to many embassies and consulates.

Characterized as "Political"

The Federal inquiry into the sale of the old Bosch Magneto Co. by A. Mitchell Palmer was characterized by Murray as a "political move." He declined to amplify that assertion beyond stating that the company's books containing the record of the sale had been placed in the hands of United States District Attorney Harris at Boston. He declared that none of the company's officials had been called before the Federal authorities to be questioned.

It has been learned in Washington that the inquiry by Harris was instituted upon instructions from Attorney General Daugherty and is in connection with the charges filed last summer by representatives of Robert Bosch, the original German owner.

Attorneys for the former German owners of the plant alleged that whereas the property was sold by Palmer for \$4,150,000, it was really worth more than \$7,000,000 and that the company's patents, copyrights, trade marks and good will had been valued at only \$1. They have charged that measures taken by the Alien Property Custodian were such as would not tend to bring about a favorable sale of the property; that the sale was not well advertised, that it was held in a remote place, and that an excessive deposit was required of bidders; that the information furnished about the property by Palmer did not do justice to the owners. Most of these allegations were met with denials from Palmer.

Kern Friend of Palmer

The attorneys for the former owners charged specifically that the property thus sold went into the hands of Martin Kern, treasurer of the Bethlehem Motors Corp., a lifelong friend of the Alien Property Custodian, with whom he had been interested in various transactions, and that other of Palmer's friends were associated with Kern in acquiring the property.

John A. MacMartin, secretary of the American Bosch Magneto Corp., has de-

M. A. M. A. MEMBERS' DECEMBER BUSINESS MUCH BETTER THAN FIRST MONTHS OF 1921

NEW YORK, Jan. 24—Purchases of supplies from members of the Motor and Accessory Manufacturers Association by automotive manufacturers in 1921 aggregated \$238,062,591. The total of past due accounts held by members of the M. A. M. A. declined from \$8,099,727 in January to \$4,220,450 in December. The total of notes outstanding fell from \$4,359,871 in January to \$3,384,250 at the end of December.

December showed a sharp falling off in sales as compared with November, although the decline was not as great as had been expected. Sales in November were \$18,998,490 and in December \$14,349,750, a falling off of 24.47 per cent. Business in October aggregated \$22,053,327. It was significant of the improved conditions in the automotive industry that December business was very much better than sales in January and February. In fact, it did not fall far short of equaling that done in the first two months of the year together. The statistics by months for the entire year follow:

Month	Total Purchases	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
January.....	\$6,264,587	.....	\$8,099,727	.....	\$4,359,871	.....
February.....	10,408,962	66.15 Inc.	6,717,165	17.07 Dec.	6,063,118	39.08 Inc.
March.....	20,120,386	93.30 Inc.	5,603,992	16.57 Dec.	5,069,877	16.38 Dec.
April.....	26,746,580	32.93 Inc.	5,352,271	4.49 Dec.	5,371,086	5.94 Inc.
May.....	26,781,350	.13 Inc.	4,505,176	15.64 Dec.	4,460,355	16.77 Dec.
June.....	22,703,414	15.19 Dec.	4,720,973	4.79 Inc.	4,012,670	10.37 Dec.
July.....	23,096,214	1.68 Inc.	5,242,046	10.79 Inc.	3,690,154	7.90 Dec.
August.....	23,397,640	1.31 Inc.	4,348,790	17.06 Dec.	3,494,510	5.30 Dec.
September....	23,141,891	1.09 Inc.	4,358,545	0.22 Inc.	3,677,500	5.24 Inc.
October.....	22,053,327	4.70 Dec.	4,512,680	3.54 Inc.	3,463,500	5.82 Dec.
November....	18,998,490	13.85 Dec.	4,352,000	3.56 Dec.	3,661,900	5.73 Inc.
December....	14,349,750	24.47 Dec.	4,220,450	3.02 Dec.	3,384,250	7.58 Dec.

clined to make any statement in relation to the Federal inquiry. George A. MacDonald, treasurer, has intimated that the trouble was being fomented by the former owners for advertising purposes.

Parts Makers Map Out Group Expansion Program

NEW YORK, Jan. 23—An ambitious program for the expansion of its group organization has been mapped out by the Motor and Accessory Manufacturers Association. The main purpose of the group idea is to promote "greater unity of purpose in the direction of economies of production and distribution, thus eliminating duplications of effort and expense."

The following preliminary classification of contemplated groups is announced by the association:

Asbestos products, axle, bearing, bumper, carburetor, chain, clutch, engine, fan forging, foundry, gear, headlight device, piston ring, radiator, sheet and pressed metal, shock absorber, spark plug, spring, starting, lighting and ignition, steel producers, steel products, top, transmission, warning signal, wheels and windshield.

TO LIQUIDATE MONITOR

COLUMBUS, Jan. 23—Receiver E. W. Pavay of the Monitor Motor Car Co., which was forced into the hands of the receiver about six months ago, has sold tools, parts, stocks on hand and patterns to the American Motor Parts Co., which held an auction of certain tools and parts recently. The sale was confirmed by the court and it is the policy to liquidate the concern. No offer for the real estate, appraised at \$85,000, has been received. Creditors' claims will be paid to the extent of 15 or 20 per cent.

Dixie Flyer Makers Will Join Combine

Stockholders Accept Plan for Re-organization Superseding all Former Arrangements

LOUISVILLE, KY., Jan. 24—Plans for the reorganization of the Kentucky Wagon Mfg. Co. and a merger with the Associated Motors Industries have been accepted by stockholders of the company.

Details of the new company that will be formed and those of the merger were not disclosed by John W. Barr, Jr., of the company, who made the following statement:

"The concern which will be formed will be one of the largest of its kind in this part of the country. Representatives of the large financial interests from Chicago and from the East, which will be partners in the merger, provided it is effected, were at the stockholders' meeting.

"It is possible that the merger will be accomplished, and if it is it will enable the Kentucky Wagon Mfg. Co. to operate on a larger scale than before."

The plan adopted by the stockholders completely supersedes all former reorganization and merger plans.

(Continued on page 202)

20,400 TRACTORS IN UTAH

COLUMBUS, Jan. 24—C. J. West, Federal-State farm statistician in Ohio, has completed a survey of the State to list the number of farm tractors in use. He reports that the number has been practically doubled in the past two years. The number two years ago was 10,469 and now is about 20,400.

Body Manufacturers Speeding Up Output

Sub-Contractors in Philadelphia Receive Orders from Builders of Automobiles

PHILADELPHIA, Jan. 23—Manufacturers of automobiles are giving sub-contractors orders to speed up production, in anticipation of an improvement in business by spring. The effect has been felt here locally and one large stamping shop is producing a record number of bodies, 400 a day, for Dodge Brothers. The E. G. Budd Mfg. Co. has taken on 500 extra men in the last few days in its body-making plant, the shops now running at 80 per cent of normal, with some divisions on full time and a few on overtime.

Orders since the first of the year call for substantial increases in daily production. The Studebaker Corp. has ordered deliveries of 150 bodies a day, with prospects of an early increase. Orders for fenders for the new type 61 Cadillac have increased and Overland bodies also are being built in greater number.

Two reasons are advanced for the sudden turn in production demands. Manufacturers had not increased orders prior to the New York automobile show, desiring to close the year with small inventories, but since the show, business has received a sudden impetus and quick orders for increased production became imperative. Price reductions is the other reason to which the inflow of orders is attributed.

Antigo Starts on Schedule of 200 Tractors for 1922

ANTIGO, WIS., Jan. 23—At the annual stockholders' meeting of the Antigo Tractor Corp., John Manser was elected president; Ernest Hirt was re-elected vice-president, and Edward Faust was elected secretary and treasurer. The past year has been spent in perfecting the organization and completing engineering details, so that production will start at once on a schedule calling for 200 to 250 machines in 1922 and 300 to 400 in 1923.

The stockholders in fifteen minutes subscribed \$25,000 additional to properly finance production. B. F. Appleby, head of the Erd Motor Co., Saginaw, Mich., was among the out-of-town stockholders present and made valuable suggestions for conducting the operation and further development of the business. The product is known as the "Quad-Pull" tractor, having a direct drive to all wheels, and has been under practical test for more than two years.

DURANT PLANT NEARS CAPACITY

NEW YORK, Jan. 24—Production at the Long Island City factory of the Durant Motor Car Co. of New York is rapidly approaching capacity and 100 cars were turned out in one day last

week. As originally designed the capacity of the plant was to be 100 a day but by the application of efficiency methods this can be increased, it is believed, to 150. The Lansing plant is turning out about 25 cars a day. The Muncie plant will begin production of the Durant six for delivery to purchasers some time in February.

Cadillac Reopens Factory School for Its Mechanics

DETROIT, Jan. 20—Cadillac Motor Car Co. reopened its technical and repair school at the factory this week for the benefit of service managers and mechanics doing Cadillac work. The school continues under the direction of Charles Rogers, who has been connected with Cadillac for seventeen years and has directed the repair school for the past four.

The instructions will be given in two week courses during which the adjustments on the Cadillac type 61 and earlier models will be completely reviewed. An examination will be held at the end of the course and distributors and dealers will be notified of the examination and attendance rating of the men they have sent to the school.

Winfield Barnes Plant Is Sold by Receiver

PHILADELPHIA, Jan. 21—Otto R. Heiligman, receiver for the Winfield Barnes Co. automobile factory, has sold the plant at Twentieth Street and Erie Avenue to B. Foster, for \$86,000. The property is assessed at \$75,000. Other premises belonging to the company and placed in the receiver's hands, was sold to F. C. Schaeffer for \$30,000. The latter property in Cherry Street was assessed at \$20,000.

These properties were put up at public auction last summer, but the bids were not accepted. The contents of the factory, including the machinery, were sold in parcels at that time, for very small sums.

Gasoline Consumption Less; Production Shows Increase

WASHINGTON, Jan. 23—Domestic consumption of gasoline decreased 104,500,000 gallons during November, according to figures compiled by the Bureau of Mines. The daily average production increased 171,856 gallons as compared with October and the stocks of gasoline increased 39,320,000 gallons.

It is significant to note that the stocks of gasoline on Nov. 30, 1921, were 140,750,000 gallons in excess of those on the same date in 1920. Exports decreased 1,250,000 gallons but shipments to insular possessions increased 1,000,000 gallons. There were 24 more plants in operation in November than in October.

Stocks of lubricating oils were increased 11,267,000 gallons during the month.

Milwaukee District Shows Further Gain

Reflects Results of New York Exhibition in Large Orders for Parts Received

MILWAUKEE, Jan. 23—Firms manufacturing parts, equipment and accessories for popular-priced passenger cars have large orders on hand for late winter and spring delivery, according to the monthly survey of Milwaukee industry and business contained in the current issue of *Business and Financial Comment*, published by the First Wisconsin National, Milwaukee's largest bank.

It says further that the motor truck industry is still quiet, but "should receive stimulation from the prospective activities of building and construction this year." It shows that the number of persons employed in Milwaukee County in December increased 2065, or 5.7 per cent, compared with November, in which month there was a decrease of 3.02 per cent from October. Motor car parts and equipment industries gained 5.07 per cent, while iron, steel and machinery gained 6.2 per cent.

Distributors Cheerful

It is encouraging to note that more recently the automotive industries have established further gains, which are believed to have grown directly out of the stimulation of passenger car demand by the New York show. Milwaukee is one of the principal centers of the parts industry in the United States, and consequently shows an almost immediate effect of rise and decline in passenger car and truck production which is based on immediate and prospective demand.

The attitude of Milwaukee distributors and dealers at this time is, perhaps, the most cheerful the trade has been able to assume in several months. The reason is the interest aroused by the fourteenth annual winter show, which opened Jan. 19 and runs until Jan. 25. The opening of the show marks the beginning of the most vigorous sales campaign of the year, and dealers generally consider the prospects for business in the coming three months more favorable than last year. Momentarily tax-paying time is creating some resistance, however.

TO LIQUIDATE PAN-AMERICAN

DECATUR, ILL., Jan. 24—E. A. Danner, president of the Pan-American Motors Corp., who took charge after the old management was ousted, will attempt to liquidate the business as quickly as possible. He believes the preferred stockholders will get 100 cents on the dollar but the common stock will not realize more than 30 cents. The common stock sold aggregated \$1,162,000 and the preferred stock \$102,000. Promotion of the company cost \$307,000. Danner has informed stockholders that approximately \$800,000 was expended by the old régime with practically nothing to show for it.

Too Much Price Talk Arouses S. A. Miles

Says Lack of Interest in Prospects Was Another Fault at the New York Show

NEW YORK, Jan. 24—Some of the exhibitors at the New York automobile show were guilty of three grave errors in the opinion of S. A. Miles, the veteran manager who probably knows more about motor car expositions than any man in the country. These three errors were:

Incessant conversation about prices.
Incompetent salesmanship.

Lack of interest in prospective purchasers.

"There were very creditable exceptions," says Miles, "but speaking generally we descended from the high class salesmanship of earlier years to a lugubrious week-long discussion of falling prices. We placed ourselves on the level of the drummer who sells pig iron by the ton or the farmer who sells corn by the bushel."

He stated further:

We suffered from price hysteria. We relegated salesmanship to the scrap heap. We encouraged the public to postpone purchases, expectant of still further declines.

We did not dwell to the extent we should have done on the results of the 20 years' experience and studious endeavor. We made all too little reference to the design and mechanical excellence of our cars and their meaning in the matter of durability, comfort and economy.

Neglected Opportunities

We neglected opportunities to discuss materials, weight, strength, durability and made little effort to compare it with that of bygone years. We did not make the most of improved workmanship. We did not present an adequate picture of the car of today, of the value of the dollar and the car, compared with pre-war times, or the added cost of material and men. We did not dwell upon the service of today and the long life of the car. We did not talk our prices up. We talked them down.

We talked price from morning until night. We radiated price. We daubed our cars with bargain counter announcements of price.

Have we salesmen with brains, familiar with the points of our machines, capable of comparison, able to ascertain what the inquirer expects in a car; to tell him how good a car is and sell him on the merits of the car?

Or have we merely automatons to tell the prospective buyer how cheap the car is and how much we expect to allow him on his old vehicle?

It is too late to prevent the harm that was done in New York but it is not too late to prevent a repetition of it in Chicago.

RUBBER PROCESS OPENS OFFICES

DETROIT, Jan. 20—Rubber Process Corp. has opened offices in the Kresge Building, this city, for the development of sales in the automotive field, particularly the tire service end, of their product, which is designed to increase the life of rubber. Tire treating stations will be

opened throughout the country. Robert W. Ingwersen, well known in the automotive field, will be in charge of the Detroit office. Other officers of the company are Frank A. Bigger, president; Eugene Siegel, treasurer, and Leo Siegel, secretary.

New Executives Join

Warren F. Fraser Co.

WESTBORO, MASS., Jan. 20—Five new executives have associated themselves with the reorganized Warren F. Fraser Co., incorporated in 1914 to manufacture cylindrical grinding machinery, plain cylinder grinders of all types, special machine tools and metal products.

Warren F. Fraser, inventor of the new automatic cylindrical grinder which the company will market, is president, and Frank McClaskey, vice-president. Sydney Player, general manager, was formerly production manager of the Taft-Pierce plant at Woonsocket, and Joseph N. Bethel, sales manager, was connected with the same company for 23 years. Maurice J. Cashman is treasurer. His assistant is Richard S. Staples. Herbert S. Indge, consulting engineer, and Alfred W. Box, factory superintendent, were, like Staples, formerly associated with the Taft-Pierce organization.

Studebaker-Wulff Buys Marion Tire; Rotary Unsold

MARION, OHIO, Jan. 23—Failing at the last minute to negotiate the purchase of the Rotary Tire & Rubber Co. of Zanesville, the Studebaker-Wulff Rubber Co. has bought the property of the Marion Tire & Rubber Co., located in this city, from Jesse P. Dice of Akron, as trustee. The Studebaker company will produce both cord and fabric tires under the Marion brand and will gradually develop the production of special cord tires to be known as Studebaker-Wulff cords.

The Marion plant is under the direct supervision of H. C. Buchanan, a director of the company and formerly production superintendent for the Kelly-Springfield Tire Co. The other officers are P. E. Studebaker, president; B. F. Wulff, secretary and general manager, and F. A. Rendon, vice-president.

The Marion company experienced financial difficulties by reason of large contracts for raw materials at high prices, which it was unable to pay on account of the depression. Before the plant shut down, 300 casings and 800 inner tubes were being produced daily. Alterations and additions which were in progress and are almost completed will increase this capacity.

Plans for taking over the Rotary plant had been completed with both the creditors and stockholders, but when the composition agreement came before the referee in bankruptcy for final acceptance, minor differences proved so great that they could only be settled by the courts.

Salesmen to Give Same Data at Show

Taught of Conditions in Industry Through Instructions from Chicago Association

CHICAGO, Jan. 23—The Chicago Automobile Trade Association has sent to its members a list of nine questions which, it is believed, large numbers of visitors to the Chicago show will ask, together with answers to these questions which the association believes salesmen might make with profit to themselves, their dealers and the industry.

The idea behind this piece of association activity is to have salesmen in the show all telling the same story to the public.

Members are asked to instruct their salesmen on these questions and answers, and there will be a general review of the subject, together with a final show of enthusiasm for the work of show week, at a mass meeting of dealers and salesmen to be held Friday evening preceding the show.

Here are the questions and answers:

Question No. 1—How is business?

Answer—Much improved. Nineteen hundred and twenty-two will be a good year in the automobile industry.

Question No. 2—Have prices reached the bottom?

Answer—Present prices are below cost anticipating quantity business. If not secured, prices must advance.

Question No. 3—What is my used car worth?

Answer—Just what it will sell for less conditioning and sales cost. New car price reductions have, of course, lowered used car values.

Question No. 4—How about price guarantees?

Answer—We don't guarantee. Practically all manufacturers have discontinued price guarantees.

Question No. 5—What is your opinion of car?

Answer—I am unfamiliar with that make of car and cannot, therefore, give an opinion.

Question No. 6—Will there be more failures among the manufacturers this spring?

Answer—No. All the weak ones have already been eliminated.

Question No. 7—The industry was pretty hard hit last year, was it not?

Answer—No. The automobile industry suffered less than the other two larger manufacturing industries—steel and packing. The steel industry suffered a shrinkage of 60 per cent; the packing industry suffered a shrinkage of 50 per cent; the automobile industry stood a shrinkage of only 25 per cent.

Question No. 8—With the new low prices have the manufacturers cheapened the product?

Answer—No. They have not. On the other hand, the cars are vastly improved as, for instance, cite your own improvements over 1914.

Question No. 9—Where is car exhibit?

Answer—Each salesman should be equipped with a diagram showing the location of the passenger car exhibits at the show and should carefully and courteously direct inquirers.

Business Follows New York Exhibit

Evidence in Metropolitan District, However, That Much Trade Is Being Deferred

NEW YORK, Jan. 23—The week following the New York show closed with an encouraging volume of passenger car sales in the metropolitan territory. There was further evidence of the fact brought out at the show that there is a decidedly sizable volume of deferred business waiting to be convinced of three things, that prices have been stabilized, that dealers mean to stick to their current announcements that they will make nothing more than value allowances on used cars and that the new and refined 1922 cars are as great a step forward in design and performance as salesmen claim them to be.

Price Still Talked

Even within a week prospects have shown some weakening in their skeptical attitude regarding prices. Cars which had big show week sale records have been going right along since and some others which did not do much more than attract interest at the show had quite a bit of closed business to boast of at the end of this week. There is still price talk along the row by prospects, but it is not quite so insistent as it was and a little extension of the period of stabilization, dealers expect, will just about silence it.

Dodge Brothers sales, on the basis of an unknown reduction retroactive to Jan. 1, are better than they were before the impending price cut was announced, but there has been no rush and a good many prospects who have made inquiries at the salesrooms and have found salesmen ignorant of the future price have declared their intentions of waiting to see what happens before they buy. Uncertainty as to the Dodge price naturally is having some retarding effect on sales in competing lines.

Many more dealers here than before the show are holding allowances on used cars down to resale values. Several dealers are not trading at all and one who has been in this class for several months reports that he made a profit in November, which was the first profitable November in the entire history of his business.

See Large Spring Business

Dealers have conducted a great many demonstrations during the week, thus convincing prospects of the truth of claims, particularly regarding new or redesigned cars, made at the show.

Prospect lists and salesmen's reports give indication that a large spring business awaits the New York trade. Some of it is being turned into cash already and it is expected that sales will increase steadily week by week unless some such unlooked for occurrence as another wave of price reductions upsets the steadily

gaining public confidence in the value of cars as they are priced to-day.

Optimism in Chicago

CHICAGO, Jan. 23—Decidedly the spirit prevailing in the automotive industry in Chicago is one of optimism. This view has been taken since the closing days of the old year. With the opening of the new year, sales that were expected to be very slow did not follow expectations and up to the present time Chicago business is better than for the same period a year ago. Country sales are slow but there is a healthy flow of sales in the cities. This is especially true of Chicago.

It is the general opinion of Chicago dealers that nothing sensational is to be expected in sales for 1922. They believe that the volume of business will increase as the season advances until business will be good. Nothing better than good business can be hoped for is the general expression. A turn for the better is expected either in March or April.

Factories in Chicago in all lines report better business than a year ago with prospects for the year infinitely better. Some of the local truck makers are doing a fair volume of business. All report sales far in excess of those of a year ago at this time. Nothing like capacity production is in evidence but sales are increasing and general business seems healthy.

Aims at Increased Truck Sales for Railway Service

DETROIT, Jan. 21—Two big avenues for motor truck business in 1922 will be in the augmentation of street railway service through the sale of buses to trolley companies and individual operators, and of railroad freight handling facilities through the adaptation by the carriers themselves, of trucks for short haul work.

Special sales campaigns are being mapped out by General Motors Truck Co. to develop this market for its product in 1922. This, with the large potential market afforded for trucks by the highways projects of the year, is expected to create a volume of business which will compare favorably with truck business prior to 1921 and keep the big plant at Pontiac on close to normal production.

5819 More Motor Vehicles Licensed in Utah in 1921

SALT LAKE CITY, Jan. 23.—A total of 48,523 motor vehicles were licensed in Utah in 1921. The truck licenses numbered 6936. The total shows a gain of 5819 over 1920.

The increase is considered entirely satisfactory, inasmuch as the population of the State does not exceed 450,000 and in view of the fact that the mining industry, especially copper, wool growing, stock raising and the sugar beet business, which are the mainstays of the intermountain region, have not yet recovered from the depression.

Syndicate Takes Seiberling Issue

Will Offer \$1,500,000 Stock of Rubber Company—Assets Listed at \$4,300,000

AKRON, Jan. 23—A syndicate of Cleveland financiers headed by Roland Meacham, Cleveland broker, has underwritten the stock issue of the new \$10,000,000 Seiberling Rubber Co. recently formed by F. A. Seiberling, former president of Goodyear. The syndicate expects shortly to offer \$1,500,000 of the Seiberling rubber stock on a basis of four shares of 8 per cent preferred with 60 shares of no par common stock for \$1,000.

The total assets of the Seiberling Co. are listed, based on appraised value, at 286 per cent of the outstanding preferred stock. Net current assets are shown to be 125 per cent of the outstanding preferred stock. The preferred stock is callable at 110, while 5 per cent is redeemable each year after Jan. 1, 1925. The proceeds of the stock issue will be used for working capital.

The Seiberling Company's first financial statement just issued shows assets of \$4,300,000 which include \$1,550,000 in the Portage plant and equipment; \$750,000 in the Lehigh plant and equipment, and cash of \$2,000,000 subject to the expenses on account of the organization.

Liabilities include 8,000 shares issued of a total of 50,000 shares authorized, of Seiberling preferred 8 per cent cumulative stock of par value of \$100, totaling \$800,000; 75,000 shares of no par common stock issued for the New Castle plant, of \$750,000, and 120,000 shares of no par common stock sold, of \$1,200,000; also \$800,000 in 7 per cent cumulative preferred stock issued for the Portage Rubber Co. Liabilities also list a capital surplus of \$750,000 based upon appraised value of \$1,559,378 for the Portage plant and represented by ownership of 7,500 shares of common stock of the Portage Company.

Belsize Passes Dividend; Future Regarded Bright

LONDON, Jan. 14 (By Mail)—Belsize Motors, Inc., in a circular to the stockholders, states it has deferred payment of the past half-year's dividend upon the cumulative preferred stock. Last year a final dividend of 6 per cent on the common stock was recommended, but the subsequent share holders' meeting deferred payment of it.

The circular adds that there are distinct signs of an improvement in trade as it affects the company and that the momentary obligations will be fulfilled as soon as the money can be withdrawn from the business without detriment to its trading commitments. Contracts for the new model, the oil-air cooled Granville-Bradshaw two-cylinder two-seater light car just placed on the market, are stated to be sufficient to keep the works running at high pressure for a considerable time.

Manager of Overland in England Honored

Wm. Letts, Now in This Country, Becomes Baronet—Mays Smith Awarded Title

LONDON, Jan. 14 (*By Mail*)—Mays Smith, president of the British S. M. M. & T. and director of the company importing Delaunay-Belleville cars from France, and W. M. Letts, managing director of Crossley & Co. and Willys-Overland-Crossley, Ltd., have received the title of "Sir," which henceforth will replace "Mr." as a prefix to their names, the honor being conferred by the Government for their "public services."

Letts has had a lifelong connection with the industry, handling many makes of American and European cars. For years his fortunes were linked with C. Jarrott, with whom he began importing the old Locomobile steamer. Their business relations were severed when Sir William became more closely identified with Crossley cars.

Sir William in New York

NEW YORK, Jan. 23—Sir William Letts, managing director of Willys-Overland-Crossley, Ltd., is receiving the congratulations of his American friends on having been made a baronet. The title of "Sir" was awarded him after he sailed for this country some three weeks ago. He said to-day he had received through the mails a large number of newspaper clippings which he expected to read on his way back as he did not think he would find time before he sailed.

Sir William came to the United States to place orders for a large supply of materials for the Overland car which is being assembled in England. The orders are being placed in anticipation of the substantial spring business which now seems certain.

Conditions in the automotive industry in England are similar to those which prevail in this country but Letts said Englishmen could not conceive how Americans could feel that they were in the midst of hard times when they have "all the money in the world" and when their taxes are only a fraction of those paid in other countries, especially England.

Disappointed in Show

He believes substantial progress in the process of reconstruction has been made within the past year but that another 18 months at least must elapse before anything like normal conditions can be restored in Europe. The general economic situation must improve radically and exchange must be stabilized before the automobile market will expand materially.

The New York Automobile Show did not particularly impress Sir William. He said he was unable to find anything really new in a mechanical way and was much disappointed in this respect although he found improved designs in

body models. He was of the opinion that the Olympia show was much more interesting than that held in New York.

Letts spoke with pride of the Overland car produced by the English company and said that it had been designed to find favor with English buyers. He said it might be possible ultimately to have the entire car English built. He believes continued price cutting either in England or the United States will lead to "financial suicide."

Letts will return to England Feb. 7 after a trip to the Middle West and Canada.

Midgley Urges Mechanical Improvements to Save Fuel

WILMINGTON, DEL., Jan. 23—In discussing the economic phases of the motor fuel problem, before the Delaware Section of the American Chemical Society, Thomas Midgley, Jr., chief engineer of the motor fuel section of the General Motors Research Corp., urged mechanical improvements.

"For obvious reasons," he said, "it is of the utmost importance to make the most efficient use we can of motor fuel from petroleum. Increased mileage per gallon can be obtained in a variety of ways. The most practical method is to increase the compression ratio of our present internal combustion engine."

He presented data to prove his contention that doubling the compression pressure will result in doubling the mileage per gallon. "This method of increasing mileage," he stated, "has only one drawback, and that is the so-called 'fuel knock'."

He said that "fuel knock" is troublesome and tends to reduce the power, but this can be overcome by the use of such materials as orthotoluidine, xylydine and monomethylaniline, thereby allowing the benefits from high compression to be fully realized.

PREMIER SECURES BOND ISSUE

INDIANAPOLIS, Jan. 23—The Premier Motor Corp. has filed a blanket mortgage for \$60,000 with the Fletcher American Bank to secure a temporary bond issue of \$60,000. M. A. Whipple, the vice-president, stated that this bond issue will be used to pay county, State and Federal taxes and to conserve working capital. It is only a preliminary step in connection with the refinancing plan now under way. The last obstacles to refinancing have now been removed, it is asserted, and a definite announcement is expected soon.

BRITAIN WANTS NEW LAMP

WASHINGTON, Jan. 23—Advices from the American Consul General at London, England, state that American manufacturers of automobile lamps may expect considerable business from Great Britain if they are able to evolve a new type of lamp which the British Minister of Transport anticipates will entirely meet the needs for a non-dazzle headlight.

Fewer Car Thefts, Aim of Legislator

Bill Introduced in New York Make Changing Identification Marks a Misdemeanor

ALBANY, Jan. 24—Designed to curb the traffic in stolen automobiles, and to render easier the recovery of cars which already have been stolen, a bill has been introduced in the 1922 Legislature which would make it a misdemeanor to "remove or deface" an identification mark on any automobile or accessory for the purpose of destroying its identity. The bill is introduced by Assemblyman T. Channing Moore.

The Moore bill is but one of a dozen measures of vital interest to the automobile world which have made their appearance before the Legislature. Among the most important of the others is one by Assemblyman James Male which would require owners of taxicabs and motor trucks to exhibit to the State Tax Commission an indemnity policy of not less than \$1,000 for property damage and \$5,000 for personal injuries before obtaining licenses.

Assemblyman Arthur E. Brundage has introduced a bill requiring motor trucks and trailers more than 6½ feet wide and of one or more tons capacity to carry a green light on highways outside of cities from one-half hour after sunset to one-half hour before sunrise.

Truck Weights Considered

Regulation of the weight and dimensions of motor trucks with penalties for violations is provided in a bill introduced by Senator Lowman. The measure provides that except with a written permission from the State Tax Commission no person shall have the right to operate on a public highway or bridge a truck with a width of body, inclusive of load, in excess of 8 ft. or with a height from pavement to the top of the vehicle or load of more than 12 ft. 6 in.

When the truck has a trailer the combined weight of truck and load or the trailer and load must not be in excess of 28,000 lb. where the vehicle has four wheels. The axles of trucks must not be closer together than 8 ft. and the weight of four-wheel trucks must be so distributed that no more than 5600 lb. rests on each wheel nor must there be more than 800 lb. of pressure per inch width on the tire of any wheel.

EXHIBITS LONDON TRACTOR

SPRINGFIELD, OHIO, Jan. 23—Before shipping one of its new tractor plows to the Minneapolis show the London Motor Plow Co. exhibited the machine in this city. The exhibition was in charge of E. H. Daniels of London, inventor of the tractor plow. Daniels states that the company will be reorganized and the manufacture of the plow will be started here at an early date.

Trade Is United on Tractor Show

Implement Dealers Give Assurances of Good Selling Year and Place Orders

CHICAGO, Jan. 24 — The seventh annual national tractor and power farming show will be held Feb. 6 to 11 in the New Exhibit building in the Minnesota State Fair grounds midway between Minneapolis and St. Paul. The dates are the same as those of the Twin Cities automobile show, which will be held in the Overland Building; which also is available to the residents of the two cities. A special bus service will be available to visitors of either show to reach the other exhibition.

There has been a tractor show in the Twin Cities for the last several years, but all previous shows have been held as a part of the automobile show. This year the National Association of Farm Equipment Manufacturers decided to make the show entirely independent of other attractions so that the educational feature might be made more important and more closely hold the attention of those who wished to learn this new and important science of farming.

Critics Change Opinion

When the show was first suggested for this section there was considerable division in the ranks of the Northwest Tractor Trade Association as to the wisdom of such a move. Much of this division of opinion it seems was based on the experience at Fargo last summer when the farmers refused to attend a demonstration and a belief that the farmers of the Northwest would not be ready to buy additional equipment before the 1922 crop was harvested. Since the time this was suggested, and the beginning of the year, this opinion has been changed and practically all of the critics are now optimistic as to the show.

One of the factors in bringing about the change of opinion was the meeting of the Minnesota implement dealers last week. These men not only declared that they were going to sell implements this year but they backed up these declarations by placing orders with the jobbers for the instruments. And it is quite surprising that many of these orders were placed with companies that are selling for cash.

Showing of Complete Lines

The nature of the exhibits have not been clearly outlined. It is expected, however, that as space allowance has been ample in most cases complete lines will be shown. Trucks made by implement houses are expected to be quite prominent. There will be at least four new tractors on exhibition.

There is ample evidence that the educational value of the show has made the proper impression in certain quarters. Governor Prues has written a letter warmly indorsing it. A very helpful in-

dorsement has come from the railroads, which have granted a fare of one and one-half fare for the round trip and half of that fare for children, which is said to be the lowest rate ever granted on the Northwestern railroads.

During the show the Society of Automotive Engineers will hold a session at the Radisson Hotel on Thursday. The day will be devoted to the reading of papers and to discussions on subjects of interest to the tractor industry. Standardization will be one topic, and P. M. Heldt, engineering editor of AUTOMOTIVE INDUSTRIES, will read a paper on this topic. There will be a dinner at night.

The same evening there will be a dinner for county agricultural agents and farm bureau men. James R. Howard, president of the American Farm Bureau, will be the speaker. During the week the Minnesota Brotherhood of Threshermen will hold its annual meeting.

December Employment Decline, 6.9 Per Cent

WASHINGTON, Jan. 20—Comparison of employment in 52 identical establishments in the automobile industry, in December, 1920, and December, 1921, by the United States Department of Labor, through the Bureau of Labor Statistics, shows a decrease of 6.9 per cent in the number on the payroll, and a decrease of 2.7 per cent in the amount of the payroll for the period of one week. The 52 establishments show that 94,475 were on the payroll as of December, 1920, and 87,990, in December, 1921. The amount of the payroll in December, 1920, was \$2,651,912 as against \$2,316,053 in December, 1921. Eight of the 14 industries included in the survey reported increases in the number of persons employed.

A study of the changes in wage rates per capita during the period Nov. 15 to Dec. 15 showed that in the automobile industry as covered by the survey there was a decrease of 4.3 per cent in the per capita earnings due to part-time operation of shops. A decrease of 30 per cent was reported by one establishment, which affected 10 per cent of the men. The wages of the entire force of one plant were reduced 20 per cent.

Malta Offers Good Market for Low Priced Small Car

WASHINGTON, Jan. 23—There is a market for small cars selling for between \$500 and \$1,000 in Malta, according to Consul Carl R. Loop. American manufacturers are advised to act promptly in the classification of this market, inasmuch as English and Italian exporters are making a strong drive for this business. It is reported that one local dealer has been trying for some time to secure a shipment of small cars, and another has repeatedly failed in his attempts to interest American manufacturers in establishing an agency.

The Automotive Division of the Bureau of Foreign and Domestic Commerce has a list of dealers in the Malta territory.

Hanch Tells Needs for Tax Changes

Points Out to Agricultural Conference How Present Levy Affects Farmers

WASHINGTON, Jan. 25—Need for repeal of excise taxes on motor vehicles as a means of lowering transportation costs of farm products was emphasized to-day by C. C. Hanch, chairman of the taxation committee of the National Automobile Chamber of Commerce, before a committee on agricultural credit and insurance of the national agricultural conference.

He pointed out that excessive and discriminatory taxes levied against motor vehicles affect agriculture and industry alike. He stressed the fact that elimination of excise taxes on motor vehicles was as essential as the removal of transportation tax on freight and passenger railroad lines.

In the course of his remarks, Hanch said:

Farmers' Costs Increased

About 3,000,000 motor vehicles are owned and operated by the farmers of the United States. The excise tax levied against the motor vehicle is passed along and paid by these farmers whose operating costs are thus increased. Furthermore, the tax on the rubber and repair parts of the motor vehicle is a penalty charged to the misfortune of the owner, the only tax of its kind levied in the United States to-day.

No one to-day will deny the utility of the motor vehicle. In a word, it is simply transportation and just as a charge against freight and passenger travel on the railway was a charge reflected directly in the loss of profits of every farmer in the country, so does the charge against the motor vehicle effect the farmer and in even larger proportion since large quantities of his produce are carried on the highways which never reach the railways, while none may be said to go direct to the railway without traveling on the highway. The repeal of excise taxes on motor vehicles is just as essential as was the repeal of the tax on freight and passenger railroad transportation.

Speaks of Less Production

The second effect is an indirect one but none the less burdensome to the farmer and to industry. Nothing can be done to slow down the productive capacity of a major industry without affecting the prosperity of all. There is no such thing as a non-essential industry. Every industry is essential to those engaged therein and the permanent prosperity of all industries is absolutely contingent upon maintaining substantially general consuming ability.

It should be obvious that any decrease in motor vehicles means a corresponding decrease in the production of all those countless raw materials, rubber, cotton, wool, leather, steel, copper, lumber, etc., which go into the motor vehicle and consequently a narrowed employment which means a narrowed consuming power. Since all use the products of the farm, a restriction on the consuming ability of the nation must be felt by the farmer.

Referendum Favors Adjustable Tariff

United States Chamber of Commerce Membership Votes on Current Policies

WASHINGTON, Jan. 25—A referendum vote by its members on fundamental tariff questions has been completed by the Chamber of Commerce of the United States. The results put the membership on record for policies which would mark important departures from earlier American procedure.

The vote for continuation of present ad valorem duties was 979 as against 833 for instituting an American valuation system. The vote on postponement of tariff legislation was 734 in favor and 1110 against. The chamber can be committed by only two-thirds majority of the votes cast.

The program to which the chamber has been committed includes flexible tariff rates to be administered by a tariff adjustment board; reasonable protection for American industries in destructive competition; maintenance of the anti-dumping principle; encouragement of export trade; measures to meet foreign discrimination.

Adjustable rates already have been proposed by President Harding. The proposal that a new board be created to administer adjustable rates was made with the idea that the tariff commission would make available pertinent facts gathered in its investigations and that the adjustment board should be distinct from a commission making investigations.

Dixie Flyer Makers Will Join Combine

(Continued from page 196)

It is believed that all negotiations will be completed within thirty days. The automobile companies figuring in the negotiations are New York, Michigan and Ohio concerns. Under the plan, each stockholder of the wagon company will receive in stock of the new company, 140 per cent of the stock held in the wagon company. The stock will be issued half in 8 per cent preferred and half in common, figured on the net tangible assets of the company. The common is expected to yield about 7 per cent.

The Louisville plant as well as the properties of the other concerns will be appraised by experts with a representative of each of the merged companies present.

The new company will manufacture motor trucks and automobiles, wagons and automobile accessories. All automobile wheels used by the Associated Motor Industries Co. will be manufactured in Louisville, it was said. Each concern in the merger would continue to operate as at present. Employment for 5000 workers, it is hoped, will be provided at the Louisville plant within

twelve months. No change in the personnel of the Louisville company will be made.

According to the terms of the consolidation and reorganization plan, the Associated Motor Industries Co. takes over everything belonging to the Louisville company, including its charter, its good will and the rights to use the names: "The Kentucky Wagon Mfg. Co.," the "Dixie Flyer Automobile," "Old Hickory and Studebaker," and names of all other products manufactured by the company.

"Old Hickory" and "Studebaker" are names of wagons manufactured by the company and it is said that the new company will develop the wagon manufacturing activities on an even broader scale than has the present company.

The wagon company's financial difficulties were said to be a result of depression in cotton production districts, the principal market of the company. It is capitalized at \$1,400,000.

Sloane Chosen Treasurer of Continental Motors Corp.

DETROIT, Jan. 24—Robert M. Sloane was elected treasurer of Continental Motors Corp. at the annual directors' meeting this week and A. A. Engstrom was elected assistant treasurer. Sloane has been with the company nine years, latterly as assistant treasurer. B. F. Tobin, Jr., was elected secretary and T. M. Simpson, assistant secretary. Both the secretary and treasurer positions are newly created, the work having been done by the executive vice-presidents.

President R. W. Judson was re-elected as were the four vice-presidents, G. W. Yeoman, W. R. Angell, W. A. Frederick and J. E. Bourquin.

L. W. Brice is the new purchasing agent of the company, succeeding H. R. Viot.

Harley Co. Makes Plans for New Type of Tractor

SPRINGFIELD, MASS., Jan. 24—Production at the plant of the reorganized Harley Co. will be under way within 30 days and in order to handle contracts for which negotiations are in progress the company has arranged to occupy additional space in a large manufacturing plant in this city. It is expected both plants will be in operation by July 1. It is further proposed to sublet portions of the contracts.

It is stated that the company will manufacture a new type of tractor and a special cultivator to be used in connection with it. The tractor is to be of such design that it can be fitted with a wide variety of implements now on the market. An extensive line of automotive equipment will be produced. Equipment for gasoline motor cars to be used on established steam railway lines is mentioned as one of the lines of production in contemplation.

A meeting will be held at an early date to choose a board of directors and perfect reorganization arrangements.

May Make All Trade Information Public

Plan Understood to Be Considered by Government Relative to Associations

WASHINGTON, Jan. 24—Announcement by the Government outlining its policy with regard to trade associations is still hanging fire. Attorney General Daugherty states that a new draft has been prepared of a statement which he and Secretary of Commerce Hoover may put out jointly, but added that this had not been agreed upon by any means.

It is the position of the attorney general that the decision of the Supreme Court in the Hardwood case was explicit as to its meaning and that the department cannot afford to discuss a subject that would make courts of the country think it necessary for the Department of Justice to supplement a decision of the Supreme Court.

It is understood that one plan in mind is to have trade associations make information public so as to overcome that feature of the Hardwood decision which condemned the practice of limiting the information to members of the Hardwood association only. This information, it is said, would take on the nature of averages as to production, stock and prices and would not deal with such statistics for individual members of trade associations.

Distribution of Data a Question

It is a question as to how the information would be distributed. Use of the Department of Commerce as the agency for this purpose, it was pointed out, might not be satisfactory on account of the delay incident in preparing the reports and forwarding them to Washington, and also by reason of the time this would require, it is contended that the value of the information would be either greatly lessened or entirely destroyed.

The most logical solution of this problem would be to use the business papers as a means for the distribution of trade information, according to some officials.

Ohio Nut & Bolt to Move from Berea to Louisville

LOUISVILLE, KY., Jan. 25—The entire office force of the Ohio Nut & Bolt Co., which will locate a plant here within the next sixty days, will be moved to Louisville from Berea, Ohio, where the company has operated for the last sixteen years, but its factory forces will be recruited locally. The concern has an annual payroll of \$100,000 and employs about 75 men.

The company will manufacture all kinds of bolts under five-eighths of an inch in diameter. A large part of the products will be handled by Louisville jobbers and manufacturers.

Incorporation will be made here with a capitalization of \$200,000. H. G. Wilkinson is president of the company.

Improvement Seen in Foreign Trade

Lee, of Commerce Bureau, Says Stocks of Cars Are Well Liquidated

WASHINGTON, Jan. 23—Gordon Lee, chief of the automotive division of the Bureau of Foreign and Domestic Commerce, will leave Washington the latter part of this week on a trip to several automotive centers not previously touched in his work of forming contact with the industry. He will be at Buffalo on Jan. 30, going from there to Chicago, Cincinnati, Dayton and Lima, Ohio, at each of which he expects to spend a day.

"Our export figures show the improvement that has been accorded to our foreign trade," Lee said to-day. "The stocks of cars in foreign centers are well liquidated, as is evidenced by the small but regular shipments to various countries. Viewed in relation to the exports from other producing countries, the percentage of American cars being sold in most of the buying countries has never been larger." He said further:

The automotive division has been functioning about five months and in that time we have formed close contact with more than 100 chief executives of the important automotive firms. Recently, we have had requests for assistance in developing their foreign trade from firms which three or four months ago had absolutely no idea as to going after foreign trade. These companies have sensed the conditions aright and are seeking now to enter this field.

As a result of deflation, intensive sales methods have been developed in foreign countries. In several places, for instance, the method of time sales of passenger cars, so common in this country, has been adopted in order to cut down the stocks that were so large the first part of 1921 and, thus, we have gained something of much importance from that once-serious situation.

The New York show revealed that our industry, so far as it pertains to foreign trade, had gotten its feet down on the ground and was ready to go after business as never before. The fly-by-night exporter has gone and in his place has come those companies which are seeking to develop foreign sales through the practice of sound, honest and fair merchandising methods.

Detroit Factory Branch Opened by Martin-Parry

DETROIT, Jan. 20—Martin-Parry Corp. has located a factory branch in Detroit as one of 29 similar branches the company is now operating throughout the country. The purpose of the branches, in addition to handling sales of commercial bodies, is to give immediate service on replacements of parts of the bodies.

The Detroit branch takes over the business conducted by Schoof-Gracey Body Co., formerly distributor for the company. The same personnel will continue, A. F. Schoof as service manager and C. W. Gracey as sales manager. R. P. Henderson, vice-president of the corporation,

will make his headquarters at the Detroit branch.

Branches in addition to Detroit thus far located are in Boston, New York, Buffalo, Chicago, Atlanta, Dallas, Houston, San Francisco, Kearny, N. J., St. Louis, Kansas City and Cleveland. The remaining branches will be located during 1922.

The factories of the company at York, Pa., and Indianapolis will ship to the branches bodies of standard to light truck chassis in knockdown condition. These bodies are now so made that any damaged part may be replaced immediately, all parts being carried at the branches complete. The branches in addition will manufacture special bodies to order and will also service all makes of bodies.

Battery Sales Increase Through Show Stimulus

PHILADELPHIA, Jan. 24—Automobile shows have encouraged the industry here to expand the volume of orders of batteries, according to Herbert Lloyd, president of the Electric Storage Battery Co. November and December, he said, brought very little automobile business. He denied the rumor that the company contemplated consolidation with another large battery manufacturer.

While there is but little buying in advance, orders recently have taken a steady pace and Lloyd expects greater demands later from this quarter. Users, other than automobilists, are maintaining normal demands and replacement is fair. Foreign business shows no improvement over last year. Lloyd added that no new types of batteries or price revisions were contemplated by the company. Prices of Exide batteries were reduced 28 per cent, effective Jan. 1, 1921.

BANKS WILL AID FARMERS

SPRINGFIELD, OHIO, Jan. 23—W. S. Thomas president of the Mad River National Bank and of the Thomas Manufacturing Co., announces that the National banks here are ready to accommodate farmers under the War Finance Corp. Motor truck manufacturers feel that this corporation will benefit them, as it will enable the farmers to secure loans so that they can enter the market. The Springfield plant of the International Harvester Co. is turning out 50 high-speed trucks daily with shipments made steadily.

HARTFORD GETS MORE TIME

HARTFORD, CONN., Jan. 24—The stockholders protective committee which is trying to work out a reorganization plan for the Hartford Automotive Parts Co. has been given until March 20 to frame its proposal. The creditors' protective committee has been given permission to present its offer between now and March 20. If neither of these plans materializes, the sale of the assets at public auction will be taken up.

S. A. E. to Discuss Service Problems

Two Technical Sessions Will Be Held in Chicago During Show Week

CHICAGO, Jan. 23—As in former years the Society of Automotive Engineers will hold a series of technical meetings and a dinner during the week of the Chicago show. The technical sessions will be held at the Chicago Automobile Club, beginning at 10 o'clock in the morning and will be devoted to automotive service and maintenance subjects in general.

On Friday, Feb. 3, the Society members and friends are scheduled to visit the Ryerson Physical Laboratory, where at 8 p. m. Prof. H. B. Lemon of the University of Chicago will present a paper on "Modern Ideas on the Nature of Matter."

The dinner will be at the Drake Hotel, Harry Horning of the Waukesha Motor Co. acting as toastmaster.

To Discuss Owner Criticisms

The technical sessions will be held on Feb. 1 in the rooms of the Western Society of Engineers, Monadnock Building. B. M. Ikert, technical editor of *Motor Age*, will present a paper pointing out some of the criticisms of present-day cars which are voiced by repairmen and owners.

J. F. Page, service manager of the Packard company of Chicago, will make an address on the problems of the man who faces the car owner when repairs are made. His talk will deal largely with commercial or executive matters and not the engineering details.

Another paper will be read by C. B. Veal which describes a novel plan of building commercial car bodies so that they may be repaired at less cost and without serious delay. This will be followed by a paper from H. C. Buffington of the Weaver Mfg. Co., maker of special garage tools and automotive repair equipment.

R. H. Grant, general manager of the Delco Light Co., will carry an unusually pertinent message to the S. A. E. members in his talk at the dinner on "How the Engineer Can Help Business at This Time."

Banker to Speak

Commercial and financial logic will form the basis of the talk to be given by H. M. Byllesby, president of the H. M. Byllesby Co., bankers of Chicago. He has chosen as his subject, "The Business Situation in Relation to the Automotive Industry."

Tickets for the dinner will be on sale during show week at the society headquarters in the lobby of the Hotel Blackstone. All members of the society will also be obliged to visit this headquarters in order to have their railroad reduced fare certificates validated on Jan. 31 or Feb. 1.

December Exports Approached \$7,000,000

Upward Trend of Trade Indicated—Passenger Car Shipments Form Chief Item

WASHINGTON, Jan. 23—The foreign shipment of American made automobiles, trucks, parts and equipments and tires totaled almost \$7,000,000 for the month of December, according to advance figures issued by the Bureau of Foreign and Domestic Commerce, through its new automotive and rubber divisions. All branches of the trade, except tires, showed a healthy increase over the preceding month, the figures proving the belief that American export trade is again in the ascendency.

2646 Cars Shipped

The chief item in this large total, which exceeds the value of the combined shipments since the early part of 1921 when delayed shipments on old orders were still going forward, was passenger cars. A total of 2,646 cars was shipped out of the United States during December, a gain of practically 600 over the preceding month. The increases, however, extended to trucks and parts, both of which aided materially in running up the larger volume of overseas shipments for the closing month of the year.

The detailed figures show:

1921		Cars	
December.....	2,646	\$2,355,282	
November.....	2,075	1,847,190	
 Trucks			
December	511	\$495,790	
November	427	364,394	
 Parts Tires			
December	2,683,850	\$1,391,625	
November	2,546,424	1,577,678	

Subject to Revision

These figures are possibly subject to some revision, particularly those relating to tires, but they are sufficiently close to the totals that will officially be announced within a few days to show that American foreign trade is steadily pointing upward. Unfortunately, however, they do not present a complete picture of this trade, because General Motors began in December the shipment of Buick and Chevrolet cars from the Canadian factories to several countries, such as Argentina, to which shipments previously had been made from the United States. The trade, of course, is familiar with the fact that Ford, General Motors and other companies having Canadian factories have shipped for many years from that country to the British Dominions, because of preferential tariffs or other reasons.

These shipments never have shown on the official United States statistics. Now General Motors has undertaken shipments to other than British countries from its Canadian plants and officials of that company are authority for the statement that the December exports from Canada, particularly to several of the

EXPORTS OF AUTOMOTIVE PRODUCTS FOR NOVEMBER AND DECEMBER 1921

Washington, Jan. 24—The following table shows the automotive exports for the last two months of last year as compiled by the Bureau of Foreign and Domestic Commerce of the Department of Commerce:

	November, 1921			December, 1921			Per cent of increase (+) or decrease (-)		
	Number	Value	Unit	Number	Value	Unit	Number	Value	
Passenger cars	2,075	\$1,847,190	\$890	2,646	\$2,355,282	\$890	+28	+28	
complete cars	1,616	1,509,143	934	1,784	1,709,264	958	+10	+13	
Chassis	459	338,047	736	862	646,018	749	+88	+91	
Motor trucks..	427	364,394	853	511	495,790	970	+20	+36	
Complete cars	226	192,094	850	161	173,595	1,078	-29	-10	
Chassis	201	172,300	857	350	322,195	921	+74	+87	
Parts of cars and trucks....	...	2,546,424	...	...	2,683,850	...	...	+05	
Motorcycles ...	500	144,696	289	863	250,457	290	+73	+73	
Airplanes .....	...	...	...	4	35,000	8,750	...	...
Airplane parts. ...	...	19,173	...	...	1,480	...	...	-92	
Total.....		\$4,921,877			\$5,821,859			+18	

South American countries, reached large totals. The improvement in General Motors shipments has been one of the manifestations of the bettered world-wide business situation which is sending upward the curve of automotive exports.

New Form of Tabulation

With the December figures, the Commerce department ends its tabulations upon the base of complete cars or trucks and chassis. Beginning with January, the figures for which will come out during the latter part of February, the shipments will be shown in three price classifications on cars and three tonnage capacities for trucks. Details of the December figures were:

Trucks		Cars		
No.	Value	No.	Value	
Complete...	161	\$173,595	1,784	\$1,709,264
Chassis....	350	322,195	862	646,018

The tire shipments were divided as follows: Casings, \$1,193,160; inner tubes, \$98,553, and solid tires, \$99,912, the latter division showing an increase of about \$11,000 over November. The chief countries to which the tire exports went were England, Argentina, Canada, British South Africa, Mexico, New Zealand, Cuba, Dutch East Indies, Sweden, Philippine Islands, Spain, Australia, Denmark and Chile.

Pabst Corp. to Produce Valve Rotating Device

MILWAUKEE, Jan. 23—Production of a valve rotating device for poppet valve engines, which has been in experimental processes for several years, is one of the new lines of activity being undertaken by the Pabst Corp., formerly the Pabst Brewing Co., which has recently reorganized its ownership and management.

Col. Gustave Pabst, son of the founder, has retired as president and is succeeded by his brother, Frederick Pabst. Harry W. Marsh, secretary-treasurer, becomes vice-president and general manager.

Supports Federal Export Fund Plan

Industry Backs Effort to Obtain Appropriation Approved by Director of Budget

WASHINGTON, Jan. 26—Various automotive export organizations have announced that they will support the program of the Department of Commerce for increased appropriations which will be used for foreign trade promotion. Practically the entire industry is behind the Department in the latter's efforts to obtain the full appropriation as approved by the Director of the Budget, a movement which was instituted by the National Automobile Chamber of Commerce.

It is understood that the General Motors Export Corp. will take definite action to emphasize the utility of the Department to the business interests of the country. The Pierce-Arrow Motor Car Co. is leading a movement among foreign trade and export clubs and the Chamber of Commerce of the United States for this purpose.

The success which has marked the efforts of the automotive division under Gordon Lee is responsible for the action of the Foreign Trade Committee of the N. A. C. C. to pay the salary of one male clerk to the chief of the automotive division and one research assistant, effective Feb. 1.

SEES GREATER ALUMINUM OUTPUT

WAUKESHA, WIS., Jan. 23—A. C. Pankratz, vice-president of the Werra Aluminum Co., manufacturing aluminum castings, expresses the belief that following the New York, Chicago and lesser of the shows being held this month and next, the automotive industries will produce a large volume of orders which will enable aluminum casting companies to extend their production schedules.

MEN OF THE INDUSTRY

William J. Cleary has been appointed assistant general sales manager of the Sharon Pressed Steel Co. with headquarters in Detroit. His duties will cover the automotive industry in general. Cleary will take up his work Feb. 1. He spent 12 years with the Studebaker Corp. as assistant general purchasing agent and for the past two years has been general purchasing agent of the Willys Corp. with headquarters at Elizabeth, N. J.

W. D. Blatz has been appointed general sales manager of the Bridgeport Brass Co. Blatz joined the company in 1915, after having had twelve years experience in the banking and brokerage business. **J. H. Brooks** has become sales manager of the automotive accessory department of the company. Since 1906 he has been associated with the automotive industry and for the past eight years has been special representative of the American Chain Co.

C. W. Hadden, actively connected with the Minneapolis Steel & Machinery Co. since 1917, has been made assistant to President W. R. Wilson of the Maxwell Motor Sales Corp. in Detroit. In 1918 Hadden took over the New York office of the Minneapolis company, for two years was manager of foreign sales with headquarters abroad and since last May has been organizing the export department in the home office.

Gregory (Gig) Flynn has resigned as vice-president and director of Edward A. Cassidy, Inc., New York. He went with that company four years ago from the Rajah Auto Supply Co., which he served for ten years, part of the time as sales manager. Flynn has not announced his plans for the future, but it is understood he intends to leave the automotive industry for some time.

John C. Hill, formerly export manager of the Westcott Motor Car Co., has become associated with the Maxwell Motor Sales Corp. and Chalmers Motor Car Co. as special sales representative in foreign fields. Hill has gone to Mexico City, where he will make his headquarters and will cover Mexico and Central America for the Maxwell-Chalmers interests.

R. Norman Miller, formerly of the Willys-Overland Corp., has been appointed director of sales of the Stewart Storage Battery Co., organized several months ago at Marshfield, Wis., and now manufacturing storage batteries. An active sales campaign will be inaugurated covering the entire United States and several foreign countries.

H. B. Price, formerly advertising manager of the Belden Manufacturing Co., Chicago, and associated with that company for several years in various engineering, production and sales capacities, has resigned, to join the advertising agency of George J. Kirkgasser & Co. He will specialize in electrical and technical advertising.

Ralph S. Wiltrot, formerly of the Stewart-Warner Speedometer Corp., the Crow-Elkhart Motor Corp. and the Huffman Bros. Motor Truck Co., has become general manager of sales of the Ogren Motor Car Co., Milwaukee, with **Foster D. Miller**, formerly of the Barley Motor Car Co., as assistant.

A. M. D. Martin has resigned as assistant general manager of the Adria Motor Car Corp., Batavia, N. Y. He was formerly general manager of the Gray Machine & Parts Corp. While he has not announced his plans for the future, he expects to locate permanently in Buffalo.

J. L. Justice, vice-president and general manager of the Edward H. Baker Corp., Buffalo, has resigned, to take an executive position with the Maxwell-Chalmers organization. He was formerly eastern supervisor for these companies and prior to that served as Pacific coast supervisor.

Julian S. Friede has resigned his position as body engineer with the Moon Motor Car Co., St. Louis, a position he has held for the last two years, to enter the retail merchandising business in Texarkana, Texas.

Harry R. Viot, for many years purchasing agent of the Continental Motors Corp., is now connected with the Werra Aluminum Foundry Co., Waukesha, Wis., in the capacity of sales manager.

Ernest R. Fried has been appointed passenger car engineer of the Pierce-Arrow Motor Car Co., Buffalo, in place of D. G. Roos, who has become chief engineer of the Locomobile Co.

W. Y. W. Rabb, foreign sales manager for the Pierce Motor Car Co., has resigned his position, effective Feb. 1. Rabb will open offices in Buffalo as foreign trade adviser to several firms.

Martin Gomez will leave the Pierce-Arrow Motor Car Co. Feb. 1, to return to Colombia, where he will establish an automobile agency.

Government Sets Lincoln Tax Due at \$610,000

DETROIT, Jan. 25—Lincoln Motor Co.'s tax obligations to the Government have been definitely set at \$610,000. Official confirmation of the amount was received to-day from Washington by Fred L. Woodworth, Collector of Internal Revenue. The Government originally had entered a claim of \$4,500,000.

Judge Tuttle, at the request of counsel for the Detroit Trust Co., receivers for the company, to-day issued an order making the back taxes a preferred claim. He also issued an order permitting the Detroit Trust Co. to issue receiver's certificates, not to exceed \$500,000, to operate the Lincoln plant.

CUBITT SHOWS LOSS

LONDON, Jan. 14 (By Mail)—The year's report of the Cubitt Engineering Co. of Aylesbury, manufacturer of the Cubitt car, discloses a gross loss of £79,368 up to July 31, 1921, of which £15,749 represents the carryover of the preference dividend to June 30, 1920. The management has reduced its inventory to current market values and generally has placed matters on a rock bottom price basis.

Major Dodson, managing director, is now on a tour of the world.

OAKLAND RESUMES OPERATIONS

DETROIT, Jan. 23—Oakland Motor Car Co. division of General Motors Corp. resumed operations to-day after a month's closing for inventory and re-equipment of the factory to manufacture its new models. Business resulting from the New York and Buffalo shows, as well as sales in other sections, has been heavy and the factory will operate on a schedule which will produce 3800 cars in February.

Winton Co. Makes Big Cut in Price

Ranges from \$1,200 on Roadster
and Touring to \$1,950
on Victoria

CLEVELAND, Jan. 23—Sweeping reductions in the prices of its various models are announced by the Winton company. They range from \$1,200 on the roadster and touring to \$1,950 on the victoria. The schedule follows:

	Old Price	New Price
Roadster	\$4,600	\$3,400
4-passenger Touring	4,975	3,600
7-passenger Touring	4,600	3,400
Coupe	5,950	4,450
4-passenger Sedan	5,950	4,450
Victoria	5,950	4,000
7-passenger Sedan	6,200	4,550

Franklin to Announce Price Increase of \$100

SYRACUSE, Jan. 23—An increase of \$100 in the price of Franklin automobiles is to be announced within a short time. It is said that dealers have already been notified of the increase. Officials of the company refused to discuss the matter.

H. H. Franklin, president of the H. H. Franklin Mfg. Co., when asked about the increase said: "The public is not so much interested in whether the price is going up or down, as it is in whether or not the market will be stabilized."

Moon Builds Smaller Six; Will Be Priced at \$1,295

ST. LOUIS, Jan. 24—The Moon Motor Car Co. is bringing out a smaller and lighter six to be known as the 6-40. It will be shown for the first time at the Chicago automobile show.

The engine is a Continental Red Seal $3\frac{1}{8} \times 4\frac{1}{4}$. The wheelbase is 115 in., smaller than either the 6-48 or 6-68. Other standard units used in the construction are Delco, Rayfield, Exide, Spicer, Borg & Beck and Fedders. At present only the open cars are coming through, but closed jobs will be put through shortly, at which time the price of the enclosed models will be announced.

FORD CANADIAN PRICES

TORONTO, Jan. 23—The Ford Motor Co. of Canada has announced reductions on Ford models somewhat larger than those made in the United States. Price of the sedan is cut \$60 to \$930; the coupe \$50 to \$480; the truck chassis \$40 to \$575, and the touring car is lowered \$30 to \$535.

WITT-WILL PRICES CUT

WASHINGTON, Jan. 23—The Witt-Will Co. Inc., has announced a reduction of \$500 on its 1½-ton and 2½-ton trucks. The former now lists at \$2,250 and the latter at \$2,750.

BANK CREDITS

Written exclusively for AUTOMOTIVE INDUSTRIES by the Guaranty Trust Co., second largest bank in America.

During the past week, call loans covered a range of 3½ per cent to 6 per cent, as compared with 3 per cent to 4 per cent in the previous week. On Monday, while a low figure of 3½ per cent was quoted, there was a brief flurry which carried call rates up to 6 per cent. On Thursday, the high was again 6 per cent, and on Friday all loans on call were put through at 5 per cent. For fixed date funds, the situation was quieter and there was a lessening in the amount of offerings. The range moved up to 4½ per cent to 4¾ per cent as compared with 4½ per cent in the previous week. Prime commercial paper rates remained unchanged at 4¾ per cent to 5 per cent.

The Federal Reserve statement of Jan. 18, 1922, showed the following reductions: \$64,122,000 in Federal Reserve notes in circulation, \$65,482,000 in the holdings of discounted and purchased bills, and \$57,866,000 in total earning assets. Total deposits, on the other hand, showed an increase of \$7,988,000, and total reserves an increase of \$10,209,000, of which gold reserves constituted \$3,103,000. The reserve ratio registered an increase from 74.7 per cent to 76 per cent.

The New York institution showed a decline of \$16,656,000 in total reserves, and a decline of \$7,089,000 in total bills on hand. Total deposits decreased \$15,679,000, and Federal Reserve notes in circulation \$14,538,000. The ratio of total reserves to deposit and Federal Reserve note liabilities combined increased from 86.9 per cent to 87.6 per cent.

During the past week, there were 71 fewer failures in the United States than in the previous week, which may be taken as an indication that the amount of failures due to year-end settlements are receding.

The year 1921 has proved to be a record-breaking year in the building industry. According to the statistical summary for 164 cities, building expenditures for the last three months in 1921 showed an increase of 89 per cent over the corresponding period in 1920; those for the third quarter an increase of 40 per cent.

During the past week two additional foreign bond issues were made in this market, when \$25,000,000 20-year 7 per cent external gold bonds of the department of the Seine, and \$3,500,000 40-year 8 per cent gold bonds of the city of Porto Alegre, capital of the State of Rio Grande do Sul in Brazil were sold by banking syndicates.

CORRECTION

NEW YORK, Jan. 25—The statement was made in the Jan. 19 issue of AUTOMOTIVE INDUSTRIES that an announcement had been made by Colonel William Guy Wall, vice-president and chief engineer of the National Motor Car & Vehi-

cle Corp. of Indianapolis, that Columbia prices had been guaranteed to April 1. This obviously was an error as the guarantee referred to the National cars and not to the product of the Columbia Motors Co., which has no connection with National. The announcement of the National guarantee was made by the Poertner Motor Car Co., which also is the metropolitan distributor for Durant cars.

B. F. Goodrich Declares Preferred Dividend \$1.75

NEW YORK, Jan. 25—Following a meeting of the directors of the B. F. Goodrich Co. to-day a preliminary statement was issued covering the company's position at the close of business Dec. 31, 1921. Total sales approximated \$87,000,000 and the loss was about \$9,000,000, due chiefly to further heavy decline in the market values of raw materials which required additional adjustment of inventory valuation at the close of the year.

Current assets were put at \$51,500,000 as of Dec. 31, 1921, and current liabilities at \$3,300,000. It was stated that the company entered the year 1922 with no bank indebtedness, against bank loans of \$29,000,000 a year ago. Officials say that combined inventories of rubber and fabric on hand and under contract have been adjusted to the market values as of the close of 1921.

Directors declared the regular quarterly dividend of \$1.75 a share on the preferred stock, payable April 1 to stockholders of record March 22.

Pietsch Will Direct Sales of Kelly Truck

SPRINGFIELD, OHIO, Jan. 25—Frank Pietsch of Chicago has been appointed sales manager of the Kelly-Springfield Motor Truck Co. and has already taken charge of the new sales organization.

Pietsch was formerly manager of the National truck division of the Packard company with headquarters at Detroit. He was also at one time manager of the White company's branch in Chicago and comes highly recommended to the Kelly-Springfield Motor Truck Co. Grayson F. Lathrop has been appointed assistant sales manager and R. B. Fuller as national accounts representative in the East, with headquarters at 120 Broadway, New York. Lathrop has been identified with the Kelly organization for seven years. Fuller was formerly in charge of the West Indies export business of the Armours.

HARES-TRAYLOR PLANS

NEW YORK, Jan. 25—if negotiations which now are pending are successful, Hares Motors will take over the sale of the line of trucks made by the Traylor Engineering & Mfg. Co. of Cornwallis, Pa. Final details of the contract have not been worked out but it is expected the plan will go through successfully in the near future.

FINANCIAL NOTES

J. I. Case Plow Works for the 15-month period ending Sept. 30, 1921, shows a total loss before Federal taxes of \$2,985,797, as compared with a surplus of \$673,365 before taxes for the year 1920. After an inventory shrinkage of \$1,244,543 in adjustment to current replacement values inventories stood at \$3,890,600. The company started its new year with inventories written to market replacement costs. For the first half of the year the company reports that orders were very heavy, more business being written from June to February than was written during the entire previous year.

Ninigret Co., recently combined with the Fisk and Federal companies, has filed a certificate with the Commissioner of Corporations in Boston stating that a reduction has been made in capital from \$4,000,000, consisting of 35,000 shares of preferred stock par \$100 common and 100,000 shares common par \$5, to \$100,000, divided into 20,000 shares of common stock of \$5 par. The reduction has been effected by the cancellation of all the authorized and issued preferred stock and 80,000 shares of common.

Ajax Rubber Co. for the first nine months of 1921 shows a loss, before providing adjustment of inventory and commitment valuation, interest on borrowed money and Federal taxes, of \$2,446,642. Total loss for the period, after interest, adjustment of inventory and other charges, was \$2,966,445. The profit and loss surplus on Jan. 1, 1921 was \$1,615,480, so that the deficit of \$3,966,445 for the nine months caused a profit and loss deficit of \$2,350,964 as of Sept. 30, 1921.

Yellow Cab Co. has voted to place dividends on a 33½ cents monthly basis instead of a quarterly one. After Feb. 1, when a quarterly dividend of \$1 a share will be paid, the rate will be 33½ cents a share monthly. John Herz has been re-elected president and Charles H. Ritter was chosen treasurer. Edward N. D'Ancona, general counsel of the company, has been made secretary.

Russel Motor Car Co., Ltd., Toronto, has declared a quarterly dividend of 1 per cent on the common stock. This compares with previous quarterly declaration of 1¼ per cent. The regular quarterly dividend of 1¼ per cent on the preferred stock has also been declared. Both dividends are payable Feb. 1 to stock of record Jan. 23.

Willys Corp. receivers, C. O. Miniger, F. P. Dennison and Francis G. Caffey, have been authorized by Judge Killits in United States district court at Toledo to employ an auditor to make a general audit of the books of the corporation and report back to the court.

Parish & Bingham Corp. reports inventory was reduced 62 per cent during the ten months to Oct. 31, 1921, and notes payable dropped nearly \$1,000,000 during the year. Gross sales in 1921 were 46.7 per cent of those in 1920.

Auburn Automobile Co. directors have authorized cancellation of 2,000 shares of preferred stock, par \$100, redeemed during 1921 in anticipation of redemption requirement to Jan. 1, 1925.

Hart-Parr Co. balance sheet as of Oct. 31, 1921, shows a deficit of \$807,767; total current assets, \$930,806 and total current liabilities, \$160,835.

Martin-Parry Corp. has declared a regular quarterly dividend of 50 cents a share on capital stock, payable March 1 to stock of record Feb. 15.

INDUSTRIAL NOTES

Powertown Tire Corp., Rochester, reports that the volume of tires manufactured in 1921 was more than 300 per cent greater than for the preceding year. One hundred persons are employed, capable of turning out 150 tires a day. At the third annual meeting Thomas J. Costello was chosen president; H. J. Crowder, vice-president; Ernest W. Ewell, treasurer; A. M. Johnson, secretary, and E. O. Benning, director. **Powertown Sales Co.**, a subsidiary, elected, at its annual meeting: A. M. Johnson, president and treasurer; J. B. Corcoran, vice-president, and Arthur E. Hagen, secretary. Both companies have declared a 3½ per cent dividend.

Minneapolis Steel & Machinery Co. has reopened its foundry and in a month will open its machine shop. Castings made in the foundry will be ready for the machine work in less than one month. President George M. Gillette states that the last thirty days have been the best the company has enjoyed in the truck business. Many orders have come from cities for trucks for road building. In the first fifteen days of January the general business of the company equaled that of January, 1921.

Hayes Wheel Co. of New York has been formed with branches in Chicago and San Francisco. The company announces the appointment of Donald Ganiard as the manager in that city. Roy H. Voss heads the organization at San Francisco and C. E. Giltner at Chicago. The company expects to enlarge its production schedule through supplying wire wheels to automobile manufacturing companies other than those now being taken care of.

Sterling Metal Products Co., organized recently at Racine, Wis., to make automotive and other metal specialties, has acquired the entire assets of the Splitex Radiator & Manufacturing Co., which made an assignment to Richard G. Harvey in favor of creditors. The Sterling company will undertake the manufacture of Splitex radiators for passenger and commercial cars, tractors, etc.

Wright Roller Bearing Co. receivers are making arrangements to resume operations at the factory of the company in Philadelphia. The receivers, Harry W. Champion and William B. Stratton, were authorized by the court at the time of their appointment to carry on the company's business.

International Harvester Co. has resumed the operation of its Milwaukee works, specializing in tractors, farm engines, etc. The force is now 1300 with hopes of increasing this number to 1500 by Feb. 1. The largest number ever employed by the Milwaukee works is 5000.

Colonial Tire & Rubber Co. stockholders have organized a protective committee for the purpose of investigating the business affairs and management of the company. Nathan Doyle, 121 West Sixty-ninth Street, New York City, is chairman.

Du Bois Tire & Tube Co. has completed installing all machinery in its new plant at Chattanooga, Tenn., which is now in full operation. Company officials state that the entire first year's output has already been sold.

Franklin Automobile Co. reports that during 1921 sales of closed cars exceeded the sales of open cars for the first time in the company's history. Fifty-two per cent of Franklin business last year was in closed cars.

Strong Textile Co., 245 West Fifty-fifth Street, New York City, has consolidated with **William Wiese Co.** and will operate hereafter under the name of William Wiese & Co. at 234 West Fifty-sixth Street, New York.

Victor Screw Works, Inc., and **Peninsular Milled Screw Co.** announce a consolidation under the name of Victor-Peninsular Co. After March 1 the firm will occupy its new factory in Detroit.

St. Louis Car Co.'s annual meeting of stockholders, scheduled for the fourth Tuesday in January, has been postponed.

Car Show at Cleveland Is Making Fair Sales

CLEVELAND, Jan. 25.—The Cleveland Automobile Show is drawing the largest crowds in local show history and sales are being made in fair numbers, but by only a few exhibitors. There is evidence of a narrowing of interest, at least as far as actual business is concerned, to some of the better known cars and to some cars in the second class of popularity but with particularly good local representation.

Cars whose manufacturers have done least in the way of price changing during the past year also seem to be receiving more general attention. The crowds and the large listing of prospects indicate, as at earlier shows, a latent demand for cars but dealers in virtually all lines confidently expect to turn these prospects into customers as soon as price stabilization is effected.

Legislative Committee Suggests Truck Measures

ALBANY, Jan. 25.—Creation of a new state department for the regulation of motor vehicle traffic is recommended in a report submitted to the legislature by a joint committee appointed to investigate the causes of automobile accidents and propose remedial legislation. The report finds that overloading of trucks and their operation at excessive speed is one fruitful cause of accidents and also tends to destroy highways. It is asserted that all trucks should be limited as to load and speed. Defective and inadequate equipment is listed as another direct cause of many accidents.

As remedial measures the report proposes: compulsory bonding by every motor vehicle owner as security to others; compulsory insurance against liability to others; compulsory compensation insurance to cover all causes of injury to persons or property.

PACKARD TRUCK SALES GAIN

NEW YORK, Jan. 25.—Lee J. Eastman, president of the Packard Motor Car Co. of New York, in a comparison of Packard truck sales and deliveries for the last three months of 1921 with those of the preceding year, states that sales were practically doubled during the latter period, that during December the sales were 100 per cent better than for that month in 1920 and that deliveries for the month were 52 per cent greater.

METAL MARKETS

Accentuated as the easy tone of the steel market has become in the last few days, it is very easy to misinterpret this condition. Producers, while eagerly competing for every ton of orders, are making concessions only on specified tonnages and appear eager to safeguard the prevailing market quotations. Concessions are relatively more difficult to obtain on sheets than on other steel products, due to the fact that sheet mills are operating at a far better rate than other branches of the industry. In spite of the readiness of many producers to shade quoted prices on most steel products when tonnages, deliveries, and specifications are inviting, sellers have the market well in hand and, if the present drive for larger orders should not be successful, it is quite likely that concessions will disappear.

Meanwhile it is psychologically interesting to note that the steel producers are convinced there will be no higher steel prices in 1922 than those now prevailing. Some of them even go so far as to make this statement for publication.

In the aggregate a considerable amount of automotive steel buying is hanging fire. Large orders have been placed, however, for full-finished sheets with the result that this commodity is looked upon as the strongest in the list of steel products. Stocks of alloy steels and cold-drawn products in consumers' hands are reported to have dwindled to such slight proportions that fresh buying has become a matter of compulsion. Alloy steel makers assert that the prices they are now quoting are rock bottom until their rate of operations is perceptibly increased through a larger volume of orders or until freight rates come down. It is surprising, however, how much "fancy" steel is still being offered by second hands. As a rule these offerings consist of specifications, descriptions and sizes which consumers do not hanker after, but the prices at which this material is offered exert, nevertheless, a depressing influence on the market.

Pig Iron.—A fair demand for malleable and foundry iron is noted from automotive foundries. The volume, however, is not impressive and most of the business consists of carload sales.

Steel.—Producers of both hot and cold-rolled strip steel claim to have received a number of contracts covering the first three months of the current year, the automotive industries leading other consumers. Although the tonnages involved are said to be modest, the contrast of this buying with the utter lack of demand that prevailed a few months ago is imparting a very cheerful tone to the strip steel market. A similar betterment is noted in cold-drawn steel bars for which contracts, ranging from 100 to 1,000 tons have been booked for delivery over the next ten weeks. In some of these transactions buyers are said to have obtained concessions of \$1 to \$3 a ton from the prevailing quotation of 2.00 @ 2.15¢, Pittsburgh base. Automotive demand for bolts and nuts continues extremely light.

Aluminum.—A fair-sized business in foreign sheets is reported. The market is irregular. Sheets, such as automotive consumers buy, are fairly steady while ingot metal is a shade weaker. Large tonnages of the latter remain in warehouses awaiting quickened demand.

Copper.—The smaller producers are cutting under the price quoted by the large interests.

Calendar

SHOWS

- Jan. 28-Feb. 4—Chicago, Automobile Salon, Hotel Drake.
 Jan. 28-Feb. 4—Chicago, National Automobile Show, Coliseum, Auspices of N.A.C.C.
 Feb. 6 to 11—Seventh National Tractor Show and Educational Exposition, Minnesota State Fair Grounds, Minneapolis.
 Feb. 6 to 11—Winnipeg, Can., Automotive Equipment Show, Western Canadian Automotive Association.

FOREIGN SHOWS

- March, 1922—Santiago, Chili, Annual Automobile Show.

April 16—Mexico City, Annual Automobile Show, Auspices of the Automotive Division of the American Chamber of Commerce.

April 22-May 1—Prague, Czechoslovakia, Fourteenth International Automobile Exhibit.

May, 1922—Quito, Ecuador, Agricultural Exposition, celebrating Centenary of Ecuador. Automotive Section.

Sept. 1922—Rio de Janeiro, Brazil, Automobile exhibits in connection with the Brazilian Centenary Association Automobilista Brasileira.

CONVENTIONS

- Jan. 30-31—Chicago, Fifth Annual Convention, N. A. D. A., La Salle Hotel.
 Jan. 30-Feb. 2—Boston, Sixth Annual Conference of the International Delivery Association, Copley Plaza Hotel.
 May 10-12—Philadelphia, Ninth National Foreign Trade Convention of the National Foreign Trade Council.
 June 11-15—Milwaukee, Annual International Convention of the Associated Advertising Clubs of the World.

June 26-July 1—Atlantic City, Twenty-fifth Annual Meeting of the American Society for Testing Materials, Chalfonte-Haddon Hall Hotel.

Sept. 18-23, 1922—Rome, Italy, Second Annual Meeting of the International Chamber of Commerce.

S. A. E. MEETINGS

- Detroit, Feb. 24, Mar. 24, April 28, May 26.
 Chicago, Feb. 1
 Minneapolis, Feb. 8-9—Annual Tractor Meeting.

New Trucks Shown at Roads Exhibit

Annual Display of Highways Building Material Finds Buyers Fewer Than Formerly

CHICAGO, Jan. 23—An estimated attendance of from 10,000 to 12,000 road engineers, contractors, State and county highway officials and members of highway associations, a greater variety of exhibits and dull interest in buying equipment marked the twelfth annual good roads congress and show which has just ended.

The road-making machinery exhibits were more complete than ever before and were given especial care and thought because of the belief among manufacturers that contractors would be in the market with a large volume of business. The buying power of those in attendance, however, did not develop into anything like the proportions of former years.

The truck manufacturers represented at the show included: Reo, Autocar, Republic, Titan, G. M. C., Parker, White, Fageol, Mack, Stoughton, Indiana, Ford, Cook, Kissel, Schacht and Four Wheel Drive. The old contention as to whether the heavy duty or light duty truck is better adapted to road-making work was very much in evidence.

Resolutions Adopted

Reo fitted up a Speed Wagon with scraper and hoist body. This was one of the new machines at the show and was the center of much interest. Another new machine was the Cook 2½-ton truck, a product of the Cook Motors Corp., Kankakee, Ill. This truck, made from standard parts, is not in production as yet.

Before the delegates to the Good Roads Congress the big questions lay in the financial, legislative and engineering aspects of improved highway construction.

Alfred Dryland, highway engineer of Middlesex, England, told the congress that American roads were dangerous because of their narrowness and predicted that at the rate of increase in American highway transportation it would not be

a great while before roadways 150 ft. wide would be necessary.

In face of this prophecy, Clifford S. Lee, of the resolutions committee, offered a resolution that met with the almost unanimous approval of the congress declaring for a minimum roadway of 20 ft.

The association also approved these additional resolutions:

Petitioning the Interstate Commerce Commission to reduce freight rates on roadbuilding materials.

Recommending the removal of interurban tracks from public highways.

Indorsing the principal of Federal aid to states in highway financing.

Endorsing the Woodruff bill, now before Congress, asking for \$100,000,000 for Federal aid purpose in highway construction for each year for five years beginning July 1, 1922.

Condemning speeding on country roads and asking for better police protection and regulation in country districts.

Spain Amends Tariff On Automotive Imports

LONDON, Jan. 8 (*By Mail*)—Following the issue in July of the draft of the revised Spanish import tariff, the markedly increased rates sought to be imposed caused a wide protest in Britain and a request for amendment. A provisional tariff has since been in vogue, but a revised rate is expected to be stabilized commencing Jan. 20.

The following figures show that the expected revisions mean a reduction of 50 per cent on the duty as first proposed, the figures in the second column denoting the new rates.

	Percent ad val.	1st tariff	2nd tariff
Internal combustion engines		tariff	tariff
(a) weighing up to 1,000 kilos..	50	25	
Over 1,000 kilos.....	30	15	
(b) Driven by liquid fuel			
With one or more cylinders up to			
1,000 kilos.....	50	25	
Over 1,000 kilos.....	30	15	
(2) With more than two cylinders	50	25	
Automobiles up to 20,000 pesetas	30	15	
More than 20,000 pesetas.....	40	20	
Wagon, coaches, etc.....	20	15	
Frameworks (armaduras) without			
motor	40	20	
Bodies	60	30	
Bodies for airplanes.....	60	30	

Shipment of Tires Started for Europe

Goodyear Makes Largest Consignment to Distributor—Akron Output Gains

AKRON, Jan. 21—One of the most positive signs of the return of the tire industry to normal is found in the shipment of pneumatic and solid motor truck tires made out of Akron this week to the Atlantic seaboard for export to Europe.

The shipment is the largest ever made out of Akron to a single distributor, and is the second largest in the city's history. It consisted of 23 freight cars and represented a value of nearly \$500,000.

The largest tire shipment on record was made during the war to the French Government by Goodyear. It consisted of 26 cars of motor truck and automobile tires.

Tire production in Akron steadily is mounting. Many companies report the heaviest production in their history. Labor efficiency has increased from 40 to 58 per cent in all factories. More tires are being built daily in Akron than at any previous time with the exception of about three months during the high mark of the tire industry's unprecedented spurt and peak prosperity in the spring of 1920.

A survey of the industry made by Akron's business leaders shows that it is beyond its pre-war peak basis, and is closely approaching the old peak of 1920. Production now exceeds 100,000 tires daily, with all companies reporting increasingly heavy spring orders from all parts of the United States and from many European points.

BILL GIVES LIEN TO INJURED

BOSTON, Jan. 24—A bill permitting a person injured by an automobile driven by another to have a lien on the automobile for the satisfaction of any settlement he may recover against the owner, is recommended for the consideration of the Legislature in a report filed to-day by the Special Insurance Commission.